TECHNOLOGY DEPT.

The Chemical Age

VOL LXIV 12 MAY 1951 No 1661

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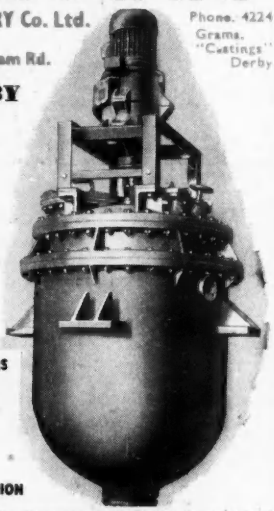

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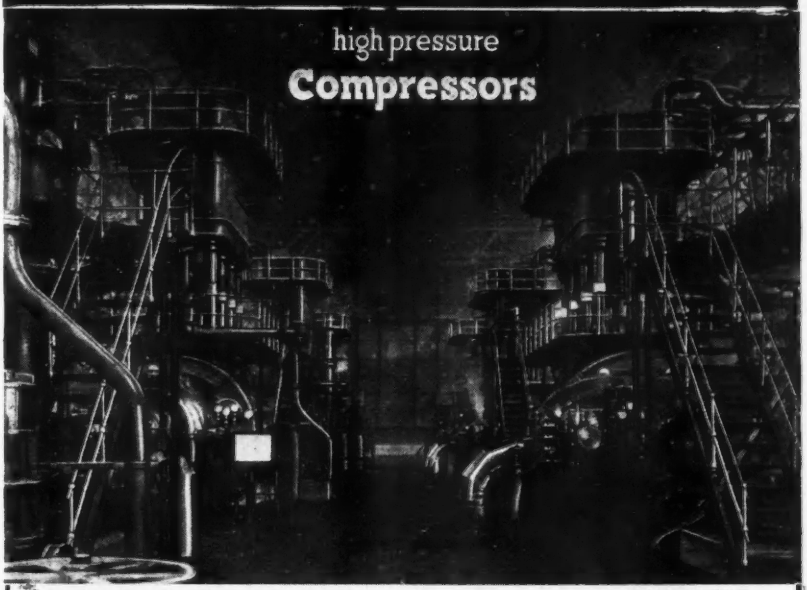

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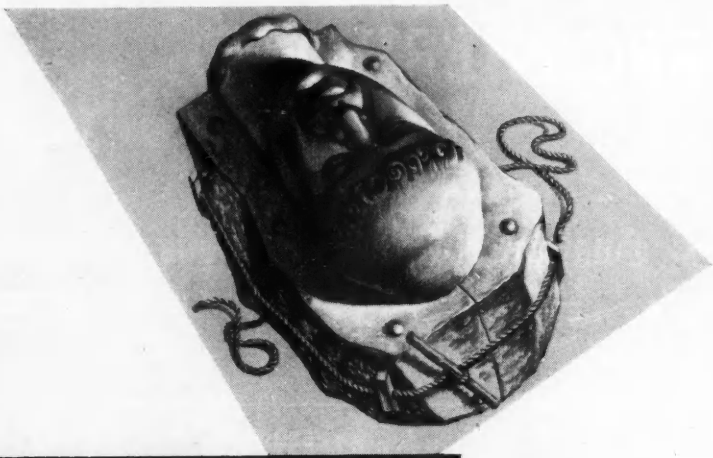

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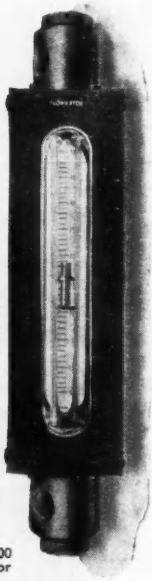

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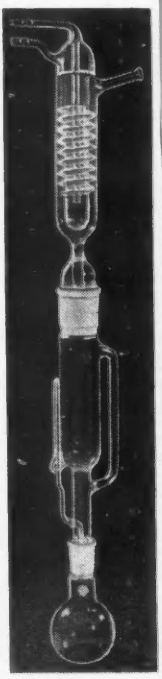

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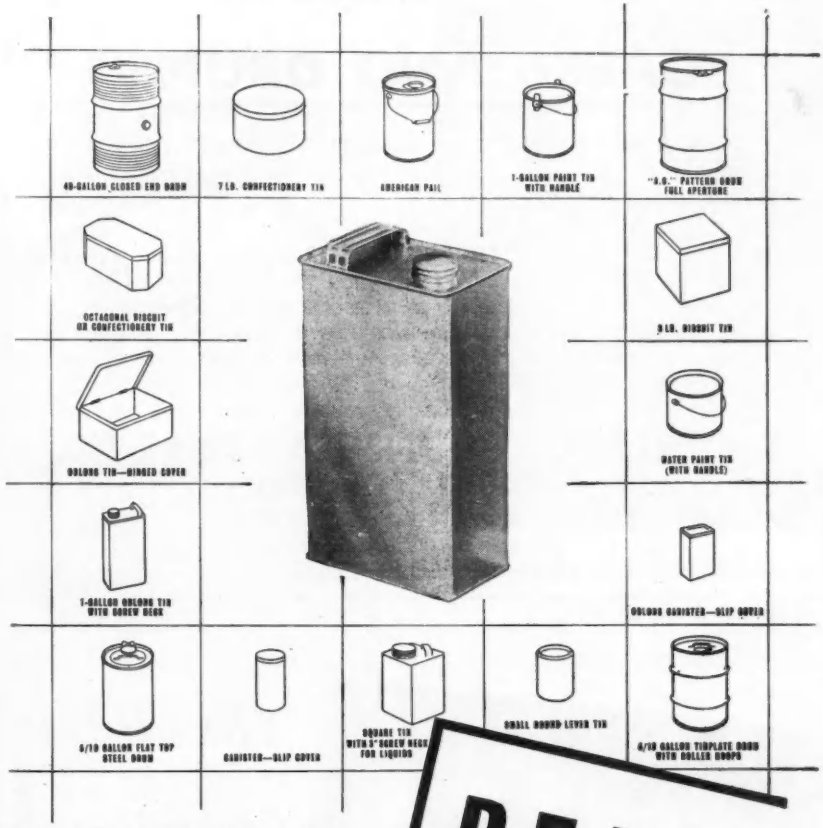
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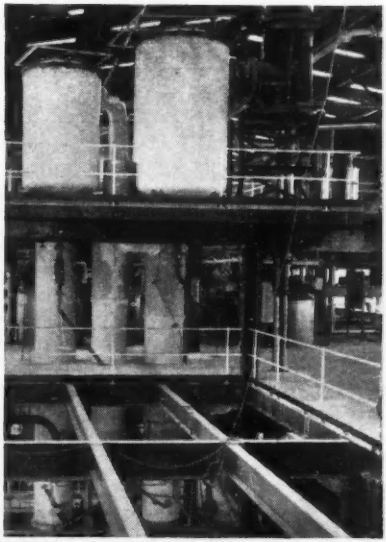

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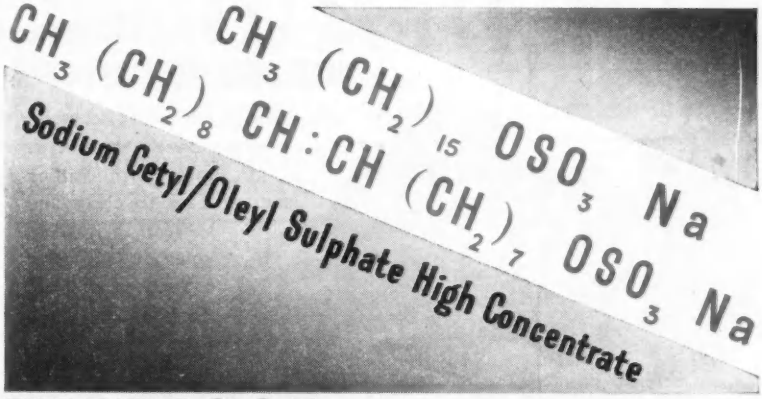

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Volume LXIV | 12 May 1951 | Number 1661

The Difficulty of Interpretation

DOES general publicity—as distinct from advertisement of specific products—do any good? Judging by the activities of major firms in all industries, including our own, the answer is emphatically yes. This method of drawing attention to some of the facts behind an industry has, in fact, proved to be a useful way of building and maintaining good-will. On all sides now, we are treated to 'prestige' announcements which variously relate to the history of chemistry, the palæontology of oil deposits and other background subjects; all this in addition to the normal kind of advertisement. Yet a further activity of this category is the publication of general technical literature, including text-books. But if this is valuable to individual firms it is likely to show equal worth for an industry as a whole.

There is nothing really new in this today and many industries already operate such a policy. We ourselves raised this matter over two years ago on the very first page of our first issue of 1949 under the same title as we have used above. We urged the setting up of a public relations bureau for chemistry and the chemical industry which could use both paid advertisement and other methods for putting our case before the public. Press campaigns, films and posters were specifically mentioned but the theme obviously permits of a wide range of enterprising possibilities. The occasion which gave rise to that article was in fact a B.B.C. broadcast which practised what we are here preaching.

What has jogged our memory, however, is the publication of a new popular science work* for that precious elusive character, 'the intelligent layman.' Modestly priced and attractively produced it forms one of a series of home study books ranging widely over the arts and sciences and including a volume on organic chemistry by Professor Read. This series of publications seems a praiseworthy venture. As part of our social responsibility, we who are associated with industrial science must contribute our part to the building of a widely cultured nation. But, in addition we can be assisted by a public sympathetically understanding the problems and achievements of the pure science on which our industry is based.

Not even the most supercilious of talented chemists should ignore or overlook new attempts by authors to assay this kind of interpretation. Nor indeed should they neglect to ask themselves if this is a role they could fill themselves. For certainly there has been very little work of this kind in the chemistry

* *'The Microphysical World' by Professor William Wilson, F.R.S. (Methuen, London, 1951, 5/-.)*

field since the war. Serious attempts at popular science writing—and we exclude from consideration here the tellers of amazing stories, the ignoramuses and the pure charlatans—have been very heavily attracted to the glamorous pursuit of explanation of atomic energy. So a new publication covering a range of subject matter so close to us forms an important event in our long-term public relations. This book, in fact, aims to do for physics (excluding astrophysics) what we have been urging for chemistry. For the layman it has aimed to provide new interpretations of present-day knowledge about atoms and molecules and the subatomic particles; it discusses spectra, X-rays, the cloud chamber and radioactivity in addition to phenomena lying wholly within the sphere of physics such as heat, light and something on instrumentation.

The objective is manifestly a high one. Would that the result matched up with this high endeavour. For, having praised the aims and emphasised the needs for such literature we must diffidently add that this promising volume unfortunately misses its mark. Success demands that teaching method be wedded to scientific knowledge. Faultless command of the matter and its logical presentation, alas, are not enough. Diagrams must not only be clearly drawn, as these certainly are, but also adequately explained. The very first page of text batters the reader with 2×10^{40} tons as part of a sentence wrapped round an arithmetical computation. The epilogue—for survivors—contains an impressive two-parenthesis sentence of no less than 70 words. Greek letters have been used without being named; terms are introduced with no or inadequate explanation. The latter include such important matters as statistical equilibrium and planetary electrons.

These are all points of presentation or treatment of subject matter where the author's difficulty in visualising laymen rather than science students can be well understood. But there are also several peculiar features about the incomplete list of elements which forms Appendix I. All the gaps in the names and mass numbers of all the elements up to No. 96 were filled by an announcement by the International Union of Chemistry in the middle of 1949. Yet the table given contains gaps and ends at uranium, No. 92. Our aim in mentioning these things is far from destructive, our attitude far from carping.

The difficulty of interpretation to the general public is seriously underrated. In fact, the story must start from real life as seen by the observant but scientifically untaught observer. A didactic approach is more valuable than a severely logical one. Diagrams should be widely employed and generously, freely captioned. From the apparent picture of real life, the tale can pass readily enough to the detailed examination of pure science. But if the lesson is to be driven home, it must close on a note again closely connected with life. That way lies success in interpreting science to those who are willing to read. For chemists, it poses a challenge. Who will take up this gauntlet?

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Notes & Comments

Ergonomics and Efficiency

NOWADAYS there seems to be a continuous urging to greater efforts of production for export, increased output for the defence programme, or some other vital national scheme. If this can be attained with less effort, then indeed the delegates to the first symposium of the Ergonomics Research Society held recently in Birmingham, may feel that their investigations into the study of the relation between man and his environment has not been in vain. That this matter is not so simple as it might at first appear was shown by the first speaker, Sir Ben Lockspeiser, secretary of the DSIR, who showed that although physical effort might be reduced, the introduction of controls—being increasingly used in chemical works—might tend to overload the sensory side of the nervous system of the operator. Man's head and brain have frequently been the object of discussion by psychologists and physiologists, but it was left to Professor W. E. le Gros Clark to draw attention to the importance of the other end of man's body. This part of man's anatomy, he declared, varied as much as any other in individuals, and he deplored the unimaginative and hard 'anatomic-shaped' seat such as was to be seen on ploughs. The professor's pertinent remarks will no doubt earn the warm approval of many schoolboys, students listening to lectures, or even workers in some chemical laboratories who have endured long hours seated upon hard benches. On the other hand, however, may there not be an ulterior motive behind this disregard of posterior comfort—at any rate in the lecture room? Might not softer seating show soporific consequences with results not only detrimental to the listener but discouraging to the lecturer?

Witch Doctors in America

BIG White Chief Make Rain is what the Red Indians would probably call the Precipitation Control Company, of Phoenix, Arizona, if they did not know that Mr. C. S. Barnes, its boss, uses silver iodide, sulphur trioxide and calcium chloride in place of their more old-fashioned methods of incantation and appeal to the gods. There are, of course, many opponents of rain-making, even disbelievers, but Mr. Barnes is of a research-minded disposition, and he seems to be getting conclusive results with his methods. Control in an important part of his plan—he does not aim to convert Arizona into a swamp in five minutes, but to water the ground gently and over a long period. For seeding operations he uses a cylinder, open at the after end, attached to the fuselage of an aircraft. By burning butane, which forces a silver iodide/acetone solution into the flame on its way to the burner and vaporises the acetone instantaneously, this contraption provides a steady stream of silver iodide particles fanned out in the burner exhaust. These are useful for supercooled clouds since they give the water vapour nuclei to crystallise on. For unsaturated clouds Barnes has developed a method for using sulphur trioxide dispensed through a similar vaporiser at the rate of 8 pounds per hour. There is no danger from the sulphuric acid produced since he covers 160 miles in an hour, over a considerable area. He has found that over the dust bowl area of West Kern County this method is effective on strato-cumulus and low-lying cumulus not sufficiently cooled to permit of the use of silver iodide. Sulphur trioxide has also been used for fog-breaking experiments, and Barnes is developing the technique of rain-stopping by deliberate over-seeding with silver iodide in order to prevent the formation of thunderheads which cause damaging storms over wheatfields. It is doubtful whether anyone will want to make it rain in England any more than it does already, but if the miracle should happen, a complete review of the field will be found in the *Chemical and Engineering News* of 19 March.

What's in a Name?

NOMENCLATURE of organic compounds has always proved a bugbear even to the fully knowledgeable chemist, because his difficulty

is that of conveying exactly what he means to the mind of a fellow chemist as simply and logically as he can, and not of adhering rigidly to any one system just for the sake of it. Systematisation of naming can never be carried to its logical conclusion for the simple reason that to do so involves such complicated names that all simplicity is lost. Who would ever call the anti-malarial 'atebrin', 3-chloro-7-methoxy-9-(1-methyl-4-diethylaminobutylamino)-acridine dihydrochloride? Add to this the fact that most natural substances are named before they are analysed, and it can be appreciated that the purists who want system in their names have got a lot to battle against. In fact the Geneva convention, established for the purpose of systematising all the names they could, broke down by trying to do too much. Mr. E. H. Tinley, B.Sc.(Lond.), Ph.C., who has just published a reprint of a series of articles on nomenclature in organic chemistry in *The Alchemist*, deals at length with the more elementary side of nomenclature, and necessarily sketches the more complicated. It is difficult to see for whom this pamphlet is intended, since it is plainly too wordy and elementary for the informed, while being too arbitrarily selective for those in ignorance. In any case, it seems pointless to lead the uninformed through a maze of names of organic compounds, many of which he may know little about, and the man who does know something about them can look up their names in any textbook, if he by any chance forgets them. The section on pronunciation at the end seeks to clarify things, but the spoken word, as the author admits, even harder to pin down than the written.

American Chemicals Expand

A RECENTLY published survey of American industry shows that the chemical industry there has larger expansion plans for the current year than any other branch of industry. 59 per cent more than in 1950 will be spent on providing new production facilities; even making allowance for the fact that the purchasing power of the dollar has dropped, this increase is still substantial. It aims at an expansion of physical capacity of about 11 per cent. The general index for expansion in all U.S. industry is 9 per cent. In 1950 more than 50 per cent of the capital expenditure of the U.S. chemical industry was devoted to replacing existing plant; for 1951 a marked change is taking place and nearly 60 per cent of the capital expenditure will go to entirely new and additional plant. Whether all the plans come to fruition may be another matter. Wherever critical materials are required —and among these steel may perhaps call the loudest tune—government sanction will be required. Washington controls are increasingly having the last word. However, it is interesting for this side of the Atlantic to note that these controls are operated solely in terms of raw materials; there would not at present seem to be any system of control by way of restricting actual capital expenditure. To-day in America goods dictate by the ton and not dollars by the hundred thousand.

What Hopes Have We?

DESPITE the size of the U.S. chemical industry's plans there will be scarcely any call for outside investments. More than 90 per cent of the proposed expenditure will come out of retained profits and depreciation. Only about 3 per cent is to be financed by the sale of stock. Although capital is available on government loan for defence production it is unlikely that chemical organisations will take any significant part of their new capital requirements from this source. The guiding principle seems to be to increase capacity without increasing capital debts. The question that only too obviously springs to mind here is whether the British chemical industry can hope to do the same in its own expansion over the next few years. The 1951 Budget, with its shape of budgets to come, is not encouraging. Should a time come when world peace seems more stable, where will the British chemical industry stand by comparison? Perhaps we shall again send out a series of 'Productivity' teams to make reports that the American factories are more efficient because they are better equipped.

Radioactive Isotopes in Industry

F.B.I. Holds a One-Day Conference

IN the lecture room of the Institution of Electrical Engineers on 1 May, the F.B.I. held a conference on the use of radioactive isotopes in industry, with Sir Wallace Akers, C.B.E., in the chair.

The conference was introduced by Sir John Cockroft, C.B.E., F.R.S., who began by surveying the stage that research into radioactive isotopes has now reached at Harwell and Amersham. The various types of radioactive elements now available for supply, he said, exceeded one hundred, all of them in many different forms and compounds, and not only does the research establishment supply their own radioactive materials, but they can also irradiate materials supplied by manufacturers. Radio sulphur and radio carbon are much in demand in various organic compounds, and phosphorus and iron are also available among many others, either in a carrier-free (pure) state, of great use in medical and biological research, or as a percentage of the normal isotope. These elements are very easily irradiated simply by placing them in the pile and withdrawing them at the end of the time required. The supply of fission products, however, such as strontium 90, ideal for use in β-ray thickness gauges, is not yet possible owing to the difficulty of separating these elements, but at the end of this year it is hoped that the position will be better.

Instruments Available

Of the instruments available for detecting radioactive materials, Sir John mentioned Geiger counters, both for α-particles and γ-rays; β-particle counters of a wide variety; and halogen filter counters for routine monitoring of products. These had a particularly long life.

Sir John also mentioned the subject of health hazards associated with the use of radioactive materials. Research workers using tracers, he said, exposed themselves to negligible risks. The radioactivity concerned with these substances is measured in millicuries, while the laboratory at Harwell deals with radiation of the order of 10-100 curies. To teach industrial workers how to protect themselves, however, the Isotope School had been opened where for £40 a worker could be thoroughly schooled in the handling of all radioactive materials. As well as this a Harwell Isotope Advisory Service was there to answer all questions free of charge and even undertake research into new methods.

Biological and Medical

The medical and biological aspects of radio isotopes are well advanced, said Sir John. Research into the mode of fertiliser utilisation, how insecticides worked, etc., are are well-developed. Industrial uses, however, have been slower in developing. The president of Monsanto Chemicals in America last year cited thirteen possible industrial applications: study of the mechanism of organic reactions—polymerisation, photosynthesis, diffusion phenomena; chemical engineering — distillation equilibrium data, efficiency of purification; industrial hygiene—pollution of water supplies; and applied chemistry — product control of inorganic impurities, as in ceramics. Sir John said that analyses could now detect 1 part in 10 million of impurities, simply by placing the material to be tested in the pile and looking out for the particular radioactivity of the element impurity.

In reply to a question by Sir Wallace Akers, Sir John said that the largest object that could be irradiated in the pile was roughly a one foot cube, but that materials of this size could not be subjected to the maximum neutron flux at the centre of the pile.

The first paper to be read to the conference was on 'Non-destructive testing and its application in industry,' by Mr. W. S. Eastwood of the Isotope Division, A.E.R.E. The ordinary physical testing of materials, said Mr. Eastwood, normally entailed degradative analysis or physical disruption of the specimens. The advantages of a machine that did not touch the material at all and could detect flaws instantaneously and record them on film were self-evident.

Mr. Eastwood dealt primarily with two types of testing. The monitoring of products and detection of flaws by means of γ-radiography; and the dimensional control

of products for thickness, etc., by means of β-radiation counters.

The source of γ-radiation is usually cobalt 60, and this can penetrate steel up to a thickness of 4 in. and expose a photographic film placed on the other side. Radon, a more expensive source, can be used for thicknesses of up to 6 in. of steel, other metals varying in penetrability. Sources are supplied by Harwell in small aluminium protective cylinders of from 2-6 in. in girth, and calibration charts are provided with each source showing the amount it decays with time, so that the user can very easily estimate the activity of his source and other characteristics. Mr. Eastwood then showed the conference a series of slides showing actual radiographs of castings, some taken in the factory where they were made, others at the place of use of the materials, showing the relative positioning of the material and the source. A number of these radiographs were taken with radio iridium, including one of a plate in a Bailey bridge. A hot tear in the casting was plainly visible. Other striking demonstrations of the potentialities of this method of analysis included an example of porosity in castings, faults in valve castings and other invisible faults ferreted out by the γ-rays.

Beta-radiation Applications

Turning to the less penetrating β-radiation counters, Mr. Eastwood pointed out that these are useful for testing or controlling the thickness of such substances as plastic films. There are two ways of using a β-particle emitter. The transmission method is used for measuring the thickness of materials thin enough for the β-rays to pass through, when the detector or counter is placed on the reversed side of the sheet. (The counter is simply an ionisation chamber.)

The reflection method is used for measurements involving plates too thick for the sensitive β-particles to pass through. Here the emitter and counter are both placed on the same side of the plate at the right incident angles, and the number of β-particles reflected is counted. This is a very good method of measuring the thickness of a film of one kind on the surface of another, as in tinplate. As the degree of reflection of the β-particle varies directly with the atomic number of the material reflecting it, it follows that the thicker the tin, the more the β-particles will be deflected and the higher the count will be in consequence. The great advantages of this method lie in the fact that both emitter and receiver lie on the same side of the plate, thus allowing measurement to be taken in inaccessible places. Two sources can also be used, one on a test piece, and any difference in readings made to read a percentage difference in thickness.

In reply to questions, Mr. Eastwood said that a β-gauge cost in the region of £250, but he thought that it regained its initial cost in a very short time. The maximum thickness of steel for which the transmission method could be used was about 25 thou., but with other metals it varied with density.

The next paper to be read to the conference was by Mr. J. L. Putman, also of the Isotope Division of A.E.R.E., on the use of radioactive tracers in industry. Mr. Putman started by describing the essential properties of radio isotopes—their inflexible nature, unaffected by chemical or physical states, and so on. The principle of tracers is, of course, to label an otherwise perfectly ordinary element (none of its chemical or physical properties alter through being made radioactive) with an unmistakable radiation which can penetrate skin, plates, metal, etc. Detection of these tracers is now possible in minute concentrations. It is possible to irradiate gold, for instance, to a strength of 5 curies per gram in one week—five times as much as natural radium. It is possible to detect radiations of 5×10^{-10} curies, and so it is possible to detect gold at a concentration of 10^{-19} gm, a fantastic quantity.

Uses of Tracers

Various tracers, of course, emit different particles. Each has it advantages. Phosphorus 32, much used in biology, is a strong β-particle emitter but its radiations are completely stopped by 3 mm. of aluminium. Cobalt 60, being a γ-ray emitter, penetrates inches of steel, and so is used for inaccessible purposes where the greater ease of detection of γ-rays facilitates their use. On the other hand, while γ-ray detection has an efficiency of about 1 per cent. Geiger counter detection of β-particles has an efficiency of 100 per cent.

Mr. Putman listed some of the uses of these versatile atoms. Firstly, in simple detection, they are very useful for underground survey markers. Moving objects such as floats on liquid levels in closed containers can be followed if marked with

tracers. The interface of liquid fuels in a pipeline can be accurately located and much fuel saved from waste by injecting a tracer into the junction (Barium 131 is used in the U.S.A.). The extent of mixing of two fuels can also be determined by the distribution of the radioactivity. Dilution and volume measurements can be made by injecting, say, sodium 24 as sodium chloride or carbonate solution at a known concentration into the input end of a turbine, and measuring the specific activity of the output water. The volume of metal in a furnace can be similarly determined by injecting minute quantities of gold 138 into the furnace.

Chemical labelling is another application of tracers of fundamental use in the study of metabolism. Reaction efficiency and separation efficiency as in the separation of krypton and xenon from air can also be evaluated, as well as, say, the determination of how much sodium is left on the surface of aluminium cleaned with sodium hydroxide previous to plating.

Transfer experiments are another application mentioned by Mr. Putman, or the elucidation by depositing radio chromium, say, on a piston ring and examining the cylinder face for activity after use. Also the determination of the loss of materials in lubricating oil can be carried out. These tracers have a multitude of applications.

Labelled Organic Compounds

Dr. W. P. Grove of the Radiochemical Centre at Amersham read a paper on some applications of labelled organic compounds. Carbon 14 is an important isotope, and apart from the metabolic studies mentioned earlier, these tracers are useful for studying the mechanisms of such reactions as the Fischer Tropsch synthesis. It has been proved here that less than 10 per cent of the hydrocarbon product is formed through the formation of iron carbide, contrary to what was thought previously. The mechanism of polymerisation of styrene and methyl methacrylate has also been studied, and the roles of initiator, moderator and stabiliser in the manufacture of neoprene and chloroprene assessed. Methane fermentation from acetic acid has also been shown to proceed via decarboxylation of the acid rather than through reduction of carbon dioxide. Penicillin and vitamin B_{12} have been labelled and much information gained of their methods of actions. Flotation research has also been facilitated.

Other papers read to the conference included one on health precautions by Mr. B. S. Smith of the Health Physics Division, A.E.R.E., and applications of radio isotopes in the textile, electrical and metal fabrication industries. Finally Mr. K. Fearnside read a paper on the future developments of radio isotopes.

IN THE EDITOR'S POST

Materials For H_2SO_4

Sir,—Re the letter by R. V. C. Marshall in your issue of 28 April.

Since nearly every industry in the country has been affected by the shortage of sulphur and sulphuric acid, it is surely untrue to say that we are not doing enough to solve the problem.

As for the extraction of pyrites from coal, this seems to me to be quite impracticable. Mr. Marshall says that he is told that each year, more sulphur is burned as fuel than British industry needs for all its requirements. I don't dispute this, but he really can't expect scientists to fix a pyrites recovery unit to each kitchen fire in the country, remembering that about one-fifth of the coal used is burned this way.

Taking into account that there is an average content of only 4 per cent pyrites in coal (0.5-1 per cent in good coal, 1-8 per cent in poorer coal), that it is very finely divided at that, and that a good proportion of the coal used in industry is not pulverised, it would certainly not be economical to introduce any kind of flotation scheme for its recovery.

I hope this is not what Mr. Marshall calls 'idle talk.' We *must* consider 'the uselessness of such and such a measure,' and 'prohibitive costs,' or it would soon become cheaper to pay a man to remove scale from metal, than to pickle it in sulphuric acid!

Billingham. P.D.F.

Brazilian Cement Output Increased

New cement mills with a combined annual capacity of 300,000 tons, are planned for the States of Rio Grande do Sul and Rio de Janeiro (Volta Redonda). Existing cement plants have been enlarging their productive capacity, and it is estimated that the resulting overall increase in output, which may exceed 400,000 tons, will make Brazil practically self-sufficient as regards cement supplies.

Expansion Continuing

Dutch Chemical Industry Developments

THE section of the annual report of the semi-State Bank for Rehabilitation (Herstelbank) that deals with the chemical development of Holland makes interesting reading. Of all loans that were put up by this institute to old and recent industrial branches of the country, those given to the chemical industry were the greatest, totalling 83,386,000 guilders. This, however, did not include the ploughing back of profits by many particular firms.

Industry Shows Growth

The figures of growth for the Dutch chemical branch on a basis number equal to 100 for the year 1938 compare as follows :—

	1948	1949	1950
Benzene products	166	191	215
Sulphuric acid	78	83	91
Phosphatic fertilizers	164	173	129
Nitrogenous fertilizers	82	88	149
Dyestuff stock (1939 × 100) ..	68	83	100
Dyestuffs (ditto)	—	105	115
Organic acids (1948 × 100) ..	—	—	170

The report stresses the importance of by-products lines as well as that of increased home output of salt and the electrolysis of it, so that more chlorine was achieved for PVC, insecticides and hydrochloric acid. The difficulty of procuring sulphuric acid proved to be a greater handicap to superphosphate than to nitrogenous fertilisers, which fact may be accounted for by the easier supply of the acid by the State Mines themselves. The same can be said regarding the nitrogen production that was resumed at Sluiskil in 1950, and also that of the MEKOG.

It is claimed that the new coke factory of the Mines will prove to be the most up-to-date in the whole of Europe. The phenol factory that is now being erected by the State Mines will greatly benefit the future prosperity of the national rayon and plastic branches. These and other projects have been made possible by loans under the Special Projects provisions.

Progress of the dyestuffs and pharmaceutical branches of the country is emphasised, but a sombre note is sounded regarding the prospective rawstuff supply of the chemical industry in general. The report does not, however, allude to the growing competition of Germany which has recently been causing considerable concern.

The Sulphur Shortage

Committee Makes Recommendations

REQUIREMENTS of native sulphur for countries of the free world now exceed available supplies by at least 1,000,000 tons according to the report issued this week by the sulphur committee of the International Materials Conference, Washington.

This deficiency is likely to increase instead of diminish unless remedial action is taken immediately and prosecuted with vigour. The committee makes the following recommendations :—

(i) Every country should make a critical examination of its sulphur and sulphur-bearing materials and develop them to the utmost, particularly for the production of sulphuric acid.

(ii) Countries which do not produce sulphur should examine the possibility of obtaining raw materials other than sulphur from elsewhere, especially for manufacturing sulphuric acid.

(iii) Conservation in the use of sulphur should be practised.

(iv) Sulphur control should be instituted in countries where it does not exist at the moment.

(v) Countries should manufacture and deliver as soon as possible plant and equipment for the production of pyrites.

(vi) Each country should furnish to the the committee not later than 31 October a report showing the progress it is making in implementing the committee's recommendations.

Pyrites First Available Means

Greater production of pyrites and an increased use of pyrités in the manufacture of sulphuric acid is given as the first available means of supplementing supplies. The report also suggests that waste smelter and industrial gases should be more utilised and that there should be an expansion in the use of such raw materials as anhydrite and gypsum, in the manufacture of sulphuric acid and ammonium sulphate.

Methods for the effective distribution of available supplies of sulphur are now being considered. In the meantime, while production plants are being expanded, every effort should be made to conserve sulphur.

Minister of Supply Opens New Works

Baird & Tatlock's Chadwell Heath Premises

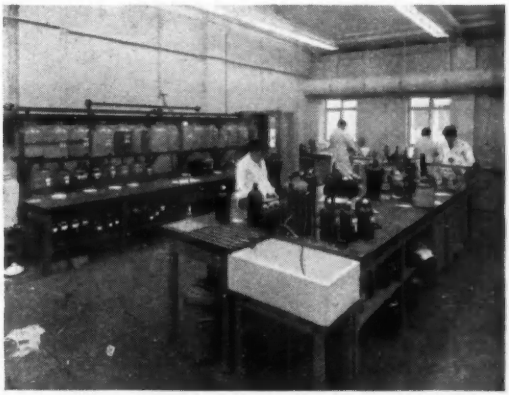
A LARGE and distinguished gathering assembled at the new offices, laboratories, and works of Baird & Tatlock (London), Ltd. [in association with Hopkin & Williams, Ltd., and W. B. Nicholson (Scientific Instruments), Ltd.] at Chadwell Heath, Essex, on 8 May, when the Rt. Hon. G. R. Strauss, M.P., Minister of Supply, performed the opening ceremony. Later a luncheon, at which Mr. Strauss was the principle guest, was held at the Savoy Hotel to mark the occasion.

The party assembled at the firm's London showrooms shortly after 9 a.m. and after a brief, informal inspection, was conveyed by a fleet of coaches to Chadwell Heath where coffee was served in the work's canteen. Shortly after 10.30 the Minister of Supply arrived and was introduced by the chairman, Mr. J. E. C. Bailey, C.B.E. Mr. Strauss was then handed the key by the firm's senior employee (a man who has been with the company for 59 years) and opened the door of the main building. The party then broke up into small groups and were conducted around the premises. When the tour was completed the coaches carried the guests back to the Savoy Hotel in London.

Proposing the toast 'The Firms' at the luncheon, Mr. Strauss paid tribute to the scientific instrument industry. Both it and the chemical industry, he said, were closely connected with his department and they had always been looked upon by his Ministry as being of the utmost importance. They had always done all in their power to help them and ensure that they were able to stand on firm foundations.

He had been interested to watch the development of Baird & Tatlock during the past few years and it gave him great pleasure to attend the opening of their Chadwell Heath premises, and to be able to congratulate them on their achievements and enterprise. The scientific instruments industry was an old one and Baird & Tatlock were themselves 70 years old. During this period they had established a fine record and they had emerged as one of the leading firms in the industry in this country and, indeed, in the entire world.

Whatever way you looked at it the scientific instruments industry was one of the most important in the country. It was a key industry as it was the basis of all scientific research. Great emphasis had recently been placed upon research and his department had attempted to give the lead in this, as it was essential if we were to maintain efficiency of industry. It was also of great strategic importance as it played a great part in the development of modern weapons. In



A section of the chemical laboratory at Baird & Tatlock's new Chadwell Heath premises

war the country which had the firmest scientific basis was bound to win. He sincerely hoped that war would never come but it depended upon our ability to build up effective defences and to make collective security really secure. If the worst came to the worst, however, he hoped that our troops would have the best possible equipment with which to defend the nation.

Helps Export Drive

It was, said Mr. Strauss, an important industry also because of the need for the nation to export as much as possible. The scientific instruments trade had been most helpful with regard to exports and Baird & Tatlock had been particularly successful in building up an export trade. The firm's success was certainly largely due to the skill of its workmen, its designers, etc., but he felt sure that everyone would agree that much of it was due to the drive and energy of its chairman, Mr. Bailey. He had been exceedingly helpful and co-operative and as Minister of Supply he was most grateful. He congratulated the firm on its growth and praised its confidence in the future. He hoped that it would prosper and flourish.

In reply, Mr. Bailey said that the firm and its associates had suffered three direct hits during the air raids on London and its environs and they had looked forward for a very long time to the day when they could open the premises which the Minister had opened that day. They had spent six to eight months in what he termed 'The Battle with the Ministries' but then the Ministry of Supply came to their aid.

Times had changed and he was confident that the co-operation which had been built up between the scientific instruments industry and the Ministry would prove of great benefit to the nation. He thanked Mr. Strauss for taking the time to open their factory in these difficult times.

Mr. Geoffrey Howard proposed the toast 'The Guests,' and Mr. A. Scivar, responded.

Baird & Tatlock was founded in 1881 in Sauchiehall Street, Glasgow, as makers of simple physical laboratory apparatus, suppliers of general laboratory apparatus and importers of German and Bohemian glassware. Eight years later in 1889 the firm moved to London and opened offices and a warehouse in St. Cross Street, in addition to the Glasgow warehouse. The manufacturing side rapidly expanded and by 1897 in addition to making physical, chemical, bacteriological and physiological apparatus, Baird & Tatlock were also making laboratory benches and fume cupboards. By 1901 increased manufacturing space had to be found and Baird & Tatlock's factory opened at Great Saffron Hill, London, E.C.1, employing some 50 craftsmen. This was still not large enough to cope with the expanding business and the present Walthamstow works were built in 1905. The firm then changed its name to Baird & Tatlock (London) Ltd., and the Glasgow warehouse was closed.

In 1929, Hopkin & Williams Ltd., who had been neighbours of Baird & Tatlock, in St. Cross Street for some time, became associated with them and the two firms continued under one control.

After losing over half the office and warehouse accommodation and all the stock during the 1940 blitz, it was found necessary to spread the activities of the firm over a network of 30 miles of Greater London in whatever temporary accommodation could be found. At one time the organisation was operating from 40 different addresses at the same time. This disaster only gave added impetus to the plans, already considered before the war, for the complete reorganisation of the companies, and finally, after overcoming many difficulties, the Chadwell Heath site was secured and removal to the present modern premises began to take place in 1950. At the same time two of the floors remaining intact at St. Cross Street were rebuilt to form the present showrooms and Research and Development Division laboratories.

Present Group Formed

Early in 1943 W. B. Nicolson (Scientific Instruments) Ltd., became associated with the Baird & Tatlock and Hopkin & Williams' organisation to form the present group of companies.

The Research and Development Division at St. Cross Street is engaged on the work involved in the augmented production programme of both new and re-designed apparatus for the B.T.L. Instrument Works at Walthamstow and the W. B. Nicolson works in Glasgow. The laboratories are equipped to handle nearly every problem relating to the design of scientific instruments, apparatus and equipment from the initial stages to the production of an

approved prototype, covered by full working drawings, which enable the instrument works to go into batch production immediately.

The Research and Analytical Laboratories of Hopkin & Williams at Chadwell Heath, have been completed recently and are equipped with the most modern fittings supplied and installed by the B.T.L. Laboratory Fittings Division. These laboratories are responsible for a number of functions, including the testing, control and purity of 'AnalaR' chemicals produced at the Ilford Works of Hopkin & Williams, carrying out small scale production of laboratory scale chemicals, preparing microscopical dyes, including 'RevectoR' stains, and research on new reagents and compounds. Examples of recent additions to the extensive range of Hopkin & Williams' products cover new reagents for organic analysis and for metals, and 'AnalaR' reagents.

The Baird & Tatlock organisation includes a large and self-contained Laboratory Fittings Division which carries out its own development work. The outstanding recent success of this branch of the Baird & Tatlock organisation was the introduction in this country of Metal Unit Laboratory Furniture.

In recent years a considerable expansion programme has been taking place and at the present time the manufacturing space at the B.T.L. Instrument Works at Walthamstow is about double that of two years ago. Shortages mostly in raw materials and skilled labour, which occur today, still tend, however, to limit the output of instruments.

The multiplicity of items manufactured by the works provides one of the major problems which has to be faced in the scientific instrument industry. Mass production methods will never apply and the best that can be hoped for is batch production with reasonably sized batches.

Over the course of each year the Chemical Works at Ilford is called upon to produce a large number of pure chemicals to a very high standard. This entails the use of many intricate processes simultaneously, and as a consequence the plant units must be interchangeable and easily cleaned. Obviously, manufacturing problems are increased by virtue of this, and careful analytical control is an absolute necessity. These problems have become increasingly acute during the past twelve years as the demand has increased, even though the Works' output has been more than doubled since pre-war days to meet the additional requirements. As space for extensions is limited, the increased output has been accomplished, in the past, by improvement in the efficiency of both plant and processes and the co-operation of all departments and individuals concerned. With the modernisation of the Chemical Warehouse at Chadwell Heath, to give efficient service and deliver against increased sales demands, the output of the Works has to be increased still further and plans are afoot for rebuilding on the Ilford site.

The business of W. B. Nicolson (Scientific Instruments), Ltd., in Glasgow, is

The Chemical Laboratory at Chadwell Heath — another section of which is shown here — is equipped with Baird & Tatlock's own fittings

housed in modern premises of 1,500 sq. ft., part of which is devoted to the manufacturing of a wide range of instruments and apparatus. A balanced arrangement of modern general purpose machine tools and plant is installed in these workshops and the present complement of 30-40 skilled instrument makers is being supplemented month by month.

The output of the B.T.L. and H. & W. works, are forwarded to Chadwell Heath for packing, warehousing and despatch. Baird & Tatlock products, in the main, go straight into stock after checking, but the Hopkin & Williams' output goes into bulk storage, from whence it is issued to the wet and dry packaging departments and made up into standard packages.

Packing, Warehousing and Despatch

The packaging department lies at one end of the conveyor belt which runs right through the stock floor into the despatch department. For the first hour of every day the conveyor is devoted solely to the passage of goods from the packaging department into stock. For the remainder of the day orders and the necessary empty boxes are sent down the conveyor belt continuously. Along the length of the conveyor belt are six stations each manned by a store-keeper, and every consignment automatically stops at each station during passage along the belt to be sent on again later when the store-keeper has included items from his stock called for on the order.

The completed consignment eventually reaches the end of the belt in the Despatch Department where the goods are checked and packed either for van delivery or goods train or shipment abroad by sea and air. This system is virtually duplicated for B.T.L. products. Another conveyor belt runs down from end to end of the warehouse, but in this case there are twelve stations, six on each side, from which to feed the empty boxes moving down the conveyor. A very large amount of the B.T.L. stock is devoted to factored articles —beakers, flasks, filter paper, porcelain crucibles, rubber tubing (the list runs into thousands of items) and all this stock must be very carefully controlled to ensure that it is always maintained.

Science and The Festival

ONE of the most intriguing exhibitions being held in connection with the Festival of Britain must be that at the Science Museum, South Kensington, which was opened last week.

Popular understanding of modern science has tended to be hampered by unfamiliar words. In this exhibition the visual appeal is predominant in presenting science as the steady discovery of knowledge about nature.

The theme, present day knowledge of the inner structure of matter both living and inert, is presented in a series of exciting displays and working models.

Starting with the minutest of all particles, the graphite of a lead pencil, this is progressively enlarged as the visitor passes through a series of corridors and rooms until it is 10,000,000,000 times its natural size, and it can be seen for the first time what an atom is.

After this introduction the exhibition develops into three main parts, the physical and chemical nature of matter; the structure of living things; and 'Stop Press,' which shows how some of the latest lines of thought in science have grown from underlying ideas shown previously in the exhibition.

A number of scientific films will be shown in the cinema throughout each day. The sessions will last about 40-45 minutes and will start at the beginning of each hour. Various aspects of chemistry, biology and physics, will be dealt with in popular form.

New Synthetic Fibre

The development of a strong new synthetic textile fibre called 'amilar' has been announced by the E. I. Du Pont de Nemours Company of Wilmington, Delaware. The company has been experimenting with the fibre since 1946 and is now planning to build a new plant in North Carolina to produce it. Technically, the new material is a condensation of a polymer obtained from ethylene glycol and terephthalic acid. It is not chemically related to nylon, orlon, acrylic fibre, or any other Du Pont fibre.

'Amilar' is said to have a high tensile strength. It is resistant to stretching, chemical bleaching, and abrasion.

MIDLANDS ANALYTICAL METHODS DISCUSSION GROUP

Some Developments in Chromatography

SOME recent developments in ion exchange and inorganic chromatography were the topics discussed at the eighth and last meeting of the first session of the Midlands Analytical Methods Discussion Group held recently in Birmingham. The speakers were Dr. T. R. E. Kressman (The Permutit Co., London) and Mr. R. A. Wells (Chemical Research Laboratory, Teddington).

The first separations using the ion exchange chromatographic technique were carried out with artificial alumino-silicate materials (began Dr. Kressman). Felix and Lang (1929) effected the first ion exchange separation of amino acids with the aid of 'Decalso', and the first ion exchange seperation of rare earths was also carried out with a zeolite (1943). Certain recent ion exchange chromatographic separations, particularly of vitamins and hormones also make use of 'Decalso'. However, the great advances in ion exchange chromatogaphy of the last five to six years have been made possible by the existence of the very stable high capacity ion exchange resins now available. The ion exchange resins made by Adams and Holmes in 1935 were not completely satisfactory, the cation exchangers having only a limited exchange capacity below about *p*H 8 or 10, while the anion exchanger was weakly basic and absorbed acids only at low *p*H values. Again, for weak organic acids the anion exchange had a low capacity, while at *p*H values of 7 and greater its capacity for anion absorption was almost zero.

Cation exchangers carrying more strongly acidic groups were then developed, containing, for example, sulphonic and carboxylic groups. These groups resulted in higher capacities, particularly at lower *p*H values, and higher rates of reaction.

Anion Exchangers

Anion exchangers were likewise being developed and the main advances were the development of resins of higher stability and higher capacity, although still of only low or medium basicity. More recently, anion exchangers containing highly basic groups have become available, which has extended the range of application enormously.

The usual chromatographic media owe their adsorptive characteristics mainly to surface action; ion exchange resins, on the other hand, are very porous with pores of a definite size, generally of the order of 5-15 Å diameter. Ions smaller than this will travel freely in and out of the pores, suffering more or less diffusional resistance according to their actual size, while ions larger than this will not be able to enter the resin. Thus, in addition to chromatographic separations brought about by different affinities between the ions and the resin, separations can be achieved by exploiting this ionic sieve effect.

Additional Technique

An additional technique is available, therefore, with ion exchange chromatography, which is absent with ordinary chromatography. Again, since both cationic and anionic resins exist, it is possible to separate acidic and basic substances by a single passage through one type or the other, *e.g.*, aniline can be separated from phenol by passing a solution through a cation exchanger which will take up the aniline leaving the phenol in solution, or through a strongly basic anion exchanger which will take up the phenol leaving the aniline in solution. Similarly, ionic substances can be separated from non-ionic.

Separations by ion exchange chromatography can be divided broadly into five groups: (1) *The separation of an ionic from a non-ionic substance or substances*: The ionic substances are taken up on an exchanger of the appropriate type (cationic or anionic) and the non-ionic substance passes through. The ions are then separated, if desired, by selective elution.

(2) *The separation of a cationic from an anionic substance*: Passage of the mixed solution through a cation exchanger will result in the removal of the cationic substance and an anion exchanger will remove the anionic substance. An example is the separation of aniline and phenol described above. The ion which is taken up is eluted with an appropriate solution, *e.g.*, the phenol by alkali or by another acid, and the aniline by an acid or another base.

An excellent example of (1) and (2) together is provided by a study of the composition of chrome tanning liquors carried out by Gustafson in 1949. In these liquors

the chromium exists as a series of complexes, and, by flowing the liquor through a cation and an anion exchanger in series, it was found that some of the chromium was taken up on the cation exchanger (cationic chromium) some on the anion exchanger (anionic chromium), and some passed through both resins (non-ionic chromium). Elution of the chromium from the two exchangers enabled the chromium complexes to be studied in detail.

(3) *The separation of cationic substances from one another*: This is probably the most important group, or, at least, that group on which most work has been done, mainly because of the separations of rare earths and nuclear fission products which can be carried out in this way. Where a sufficient difference exists between the affinities of the several cations for the resin, it is generally sufficient to absorb the ions in a narrow band at the top of a column of resin and then to elute them with, say, dilute hydrochloric acid, when the ions will appear in the eluate in the order of their affinities, that with the lowest affinity appearing first. If the conditions of particle size, flow rate, etc., are correctly adjusted, typical peaks are produced when the concentration of the ions in the eluate is plotted against the volume of eluate.

Where insufficient differences in affinities exist, separations can frequently be achieved by enhancing these differences by the formation of complexes, *e.g.*, in the separation of the rare earths. The affinities of the rare earth cations for a cation exchanger are very similar. The affinities of their citrate complexes, however, are appreciably different, mainly because of the different stabilities of those complexes, and good separations are obtained by eluting with ammonium citrate solution.

(4) *The separation of anionic substances from one another*: The principles of this type of separation are similar to those underlying the separation of cationic types. Work along these lines has been held up until recently by the lack of strongly basic resins, but this type of exchanger is now available and it is expected that ionic separations will attain greater importance. Indeed, there are already signs of this in recent published work, which deals with the separation of rare earths and fission products by forming the anionic complexes, absorbing these on an anion exchanger and then eluting with HCl, HNO_3, etc. Amino acids may also be separated by taking them up on the anion exchanger *via* their COOH groups, and then eluting them selectively with, say, HCl.

(5) *Separations based upon ionic size*: The ionic sieve effect already referred to can be used to effect easy separations of small ions from large ones. A good example of this is the separation of inorganic salts from dye solution. Thus, 'De-Acidite E' will take up simple inorganic acids rapidly and completely, but its pores are too small to accommodate the majority of dye acids; several sulphonic acid dyestuffs have been purified by flowing a solution first through a cation exchanger, which converts the dye and the inorganic salts to the free acids, and then through a column of 'De-Acidite E' which absorbs the inorganic acids and allows the dye to pass through almost quantitatively. The dye appears as the free acid, and can be titrated if desired.

Some Applications

An example of particular appeal is the isolation and partial analysis of the toxic substance in Agenised wheat flour published recently. The flour is subjected to enzyme digestion, then hydrolysed and electrodialysed. Following the removal of the aromatic amino acids, the residual neutral amino acid mixture is fractionated on 'Zeo-Karb 215', and a fraction obtained from the column which contains the toxic factor. Further fractionation gives a pure crystalline specimen which is probably a derivative of methionine.

A weak (carboxylic) acid resin combined with the maltol assay method enables the estimation of streptomycin in fermentation broths to be carried out. The antibiotic is absorbed at *p*H 9 on the sodium form of the resin, then eluted with 0.2N hydrochloric acid. The eluate is hydrolysed to maltol by heating with 4N sodium hydroxide and the U.V. absorption at 322 mμ is measured on the sample before and after heating. The difference is converted to original streptomycin potency with the aid of a standardisation curve.

Carbonate-free caustic soda can very conveniently be prepared with the aid of a strongly basic anion exchanger like 'De-Acidite FF'. This resin has a higher affinity for the carbonate anion than for hydroxyl. The method is to take rather more than the required volume of alkali with no special precautions other than washing the caustic

sticks, and to pass the solution through a column of the anion exchanger in the free base form. The eluate is carbonate-free hydroxide which may be standardised in the normal way.

When a solution containing dissolved salts is passed through a column of a cation exchanger containing exchangeable hydrogen ions, the cations of the salts are taken up and an equivalent quantity of hydrogen ions are liberated in their place. Titration of the acidity so produced gives a measure of the total salt content and of acid-salt ratio in chrome tanning liquors. In this method the free acid is obtained by direct titration and the total acid by titration after passing through a column of 'Zeo-Kark 215'. The difference between the two titrations gives the measure of the salt content. The same principle has been used for the determination of phosphorus in phosphate rock. The rock is dissolved in HCl, the solution passed through a hydrogen exchanger and the free phosphoric acid in the eluate titrated to a phenolphthalein end-point. The same method again can be used to determine the total cations in water, the acidity produced on passing the water through a hydrogen exchanger being titrated with standard alkali.

Super conductivity water, with a conductivity 1/30 of that of normal distilled water may be prepared by an ion exchange process in which the cation and anion exchangers are contained in a single column. The exchangers can be readily regenerated.

Cation exchange resins containing the groups SO_3H, SO_3H + OH, and COOH + OH, and anion exchange resins containing the groups NH_2, NH, and NR_4 are available commercially.

Mr. Wells then took up the discussion.*

Recent developments in inorganic chromatography (he said) have in general been in the field of paper chromatogaphy. Exceptions are ion exchange methods and those employing organic reagents as absorbents. Erlenmeyer and Dahn used 8-hydroxyquinoline as adsorbent, and this has been applied to the determination of zinc in cupro-nickel and silver in copper-zinc brazing alloys. Similarly, columns of dimethylglyoxime have been used for the detection of nickel in the presence of large concentrations of interfering metals. A number of workers have extended the range of separations possible on alumina. Particular attention has been paid to the separation of metals of the platinum group and the order of adsorption on alumina has been given as Pt > Pd > Ir > Os > Rh, but this appears to be somewhat dependent upon which salt of the metals is used. Considerable evidence has been brought forward to support a proposal that the mechanism of the adsorption of inorganic materials on alumina is hydrolytic according to the following equations:—

$$6M^{++} + 6H_2O \rightarrow 6M(OH)^{+} + 6H^{+}$$

$$Al_2O_3 + 6H^{+} \rightarrow 2Al^{+++} + 3H_2O$$

$$2Al^{+++} + 2H_2O \rightarrow 2Al(OH)^{++} + 2H^{+}$$

It may be mentioned at this stage that the order of adsorption of a number of metals on the inorganic adsorbent zinc sulphide (originally used by Bach as an adsorbent for the separation of copper and cadmium) has been given as Au, Os, Pd, Hg, Ag, Bi, Cu, Pt, Rh.

As regards column size, many workers prefer a broad rather than a long column where possible, as a long column is often more difficult to pack. Uranium may be separated satisfactorily on a broad column, but hafnium/zirconium mixtures are best separated on a long column.

Cellulose is generally impure if prepared from plant materials and anomalous adsorption effects are encountered. Methyl and ethyl cellulose are no more effective than cellulose, though nitrocellulose is a more powerful adsorbent.

Cellulose pulp often contains amounts of iron; consequently, large blanks are incurred if the cellulose is not pretreated with dilute hydrochloric acid.

Alumina columns are difficult to extrude, whereas cellulose columns may be easily extruded. However, in both cases it is more convenient to wash through with a selected solvent.

An increasing number of papers have appeared detailing the application of paper chromatography to inorganic separations. The techniques used may be divided into two main groups, (i) those in which separations are carried out on sheets or strips of filter paper and (ii) those carried out on columns of cellulose pulp.

The separations carried out on sheets of filter paper may be further subdivided in a number of ways. Some workers have used the method of downward diffusion of the solvent, as recommended by Martin *et al.* in their original work on the separation of

* *Reported with the kind permission of the Director of the Chemical Research Laboratory, Teddington.*

amino acids. Others have preferred the capillary ascent method of Williams and Kirby. A number of investigators have used the rapid method due to Rutter, or Woiwod's modification of this method. In Rutter's technique, solvent is fed to a spot of the test solution placed in the centre of a circle of filter paper, supported horizontally on a glass plate having a small hole at the centre. Two parallel cuts 2 mm. apart are made from one edge up to the centre of the filter paper and the tail so formed is bent at right angles, cut to a length of 1.5 cm., allowed to pass through the hole in the glass plate and to dip into the solvent. In this manner, chromatograms consisting of concentric rings are formed. In Woiwod's modification, a roll of filter paper through a hole in the centre of a circle of filter paper acts as a wick for the solvent. Spots of the test solution are placed in a circle round the control hole. In general, the separations are similar whichever method of solvent flow is used.

Separations Achieved

Various types of separation are possible and details for a large number have been published. In cases involving exceptional solubility, one metal has been separated from a number of others, *e.g.*, uranium from most other metals, gold from the platinum metals, mercury from the metals of analytical group IIa, and thallium from iron, copper, nickel and cobalt. Pairs of metals normally difficult to separate have been isolated from each other, *e.g.*, selenium from tellurium, thorium from scandium, zirconium from hafnium, and beryllium from aluminium. The individual members of a group of metals have been separated. Thus the metals of each group of the normal qualitative analysis tables have been separated. In the same way groups of rarer metals such as the platinum metals or mixtures of aluminium, indium, gallium and zinc have been separated.

Another use of paper strip chromatography has been as an aid to further analysis. In this way a mixture of eight metals, vanadium, copper, lead, uranium, iron, molybdenum, bismuth and antimony, can be divided into two groups of four in which each metal may be determined on the polarograph without interference. Extremely complex mixtures have also been divided into groups of metals in order to increase the ease and efficiency with which the individual metals may be tested for by normal qualitative 'spot' tests.

It is possible to separate anions as well as cations by paper chromatography, and details have been published for the separation of various mixtures of anions with a common cation present. Thus, fluoride, chloride, bromide and iodide may be separated with a variety of solvents.

Several devices have been employed for increasing the degree of separation obtainable. Complexing agents, such as benzoyl acetone, which have the effect of increasing the solubility of the metals in organic solvents have been added to the solvent. When dealing with a mixture containing a large number of metals, advantage has been gained by the use of two-dimensional chromatography, which has been further extended, in some cases, by the use of as many as three solvents. Thus a chromatogram may be run in one direction on a sheet of paper with one solvent, then in a direction at right angles to the first with another solvent and, finally, again in the original direction with a third solvent.

A number of these paper strip separations have been made quantitative, *e.g.*, gold from the platinum metals, uranium from all other metals, aluminium from iron and titanium, and thallium from nickel, cobalt, copper and iron. It has also been shown possible to separate and estimate each of the metals nickel, manganese, cobalt, copper and iron in mixtures of all five. Methods of removal of the desired cation from the paper have varied. Where the metal travels in the solvent front, the piece of filter paper has been tapered and the solvent run until it drips from the pointed end. The metal is thus isolated in a few drops of solvent. In other cases the zone containing the metal has been cut out and the metal estimated after destruction of the cellulose.

Cellulose Separation Columns

The amount of material dealt with by strips or sheets of filter paper has usually to be limited to a few milligrams, but a considerable scaling up is possible by the use of columns of cellulose pulp. For analytical purposes columns of 2 cm. diameter have proved useful, but columns of up to 7 cm. diameter have been used for preparative purposes and no objection to a further increase in scale is apparent. Preparation of a suitable pulp by acid treatment of filter

paper presents no difficulty, but pulp suitable for quantitative work is now commercially available (Whatman's). For many separations it has been found advantageous to render the inner surface of the glass tube in which the column is prepared water-repellent in order to prevent 'wall' effects due to creep of water from the test solution down the walls of the tube. Treatment of the tube with a carbon tetrachloride solution of a silicone such as Dow Corning Fluid 200 (Albright & Wilson, Ltd.), followed by baking, has proved suitable for this purpose. In separations where hydrofluoric acid has been present in the system, tubes of polythene have replaced the glass extraction tubes.

Types of Separation

As with separations on paper strips, the separation obtained on columns may be divided into a number of types. Quantitative separation of one metal from a number of others has been obtained. In this case the metal being estimated is washed from the column and recovered from the eluent, while impurities are retained on the cellulose. Uranium has been estimated in a large number of minerals by such a process, gold has been separated from the platinum metals, mercury from the other metals of the analytical group IIa, zinc from the metals present in solder, and thorium from a number of minerals. Several metals have been estimated in a mixture by washing out one after another from a column and collecting the eluent in a number of fractions. This has been carried out in some cases using only one solvent and in other cases by eluting one metal with one solvent and then changing the solvent for the elution of the next metal. Nickel, cobalt, copper and iron have been separated from each other, while niobium and tantalum have been separated from each other and from other metals by this technique. The last procedure has been reversed for the quantitative removal of a number of impurities from nickel solutions. The impurities are extracted together, while the nickel remains on the cellulose. The separation is of particular interest in that it has been shown possible to extract as many as six metals, as chlorides, with a ketonic solvent containing hydrochloric acid, even when the metals are present in the test solution as sulphates. In a number of cases separations have not proved sufficiently quantitative for analytical purposes, but have been used for the preparation of samples of pure materials. Thus zirconia has been prepared free from hafnia, and scandia has been prepared free from the rare earths.

Theoretical Considerations

Although the factors producing separations appear to be understood, such practical points as choice of solvent and anion remain empirical. Separations first of all depend upon the solubilities of the salts present in the organic solvent used. When dealing with cations, the associated anion is important since the solubility is usually dependent upon the formation of a metallic salt-mineral acid-organic solvent complex. Thus, by a suitable choice of acid, selective extraction can play a major part in a separation. The solubility of a metallic salt in the members of an homologous series of organic solvents, with few exceptions, decreases with increase of carbon chain length and difficulty is not usually experienced in deciding upon the optimum solvent.

The second major factor in producing separations is the partition of the inorganic material between the mobile organic phase and the stationary water phase present in the cellulose. As a result the constant R_F values required by Martin's theory of partition chromatography are obtained for the great majority of separations. Complicating factors may be introduced by the presence of mineral acids in the solvent, and this is particularly noticeable with strip separations. Water is preferentially absorbed by the cellulose from the solvent so that a water gradient is produced on the strip. This in turn leads to an acid gradient as the acid undergoes partition between solvent and water in the cellulose.

Finally, differences in the degree of adsorption have been noted on cellulose pulps prepared by different methods. In general, an increase in active end groups such as aldehyde, carbonyl, and carboxyl in the cellulose leads to stronger adsorption. This accompanies an increase in reducing properties of the cellulose, which will again tend to prevent extraction, since metallic salts are less soluble in organic solvents in their lower valency forms. It is even possible in a few cases that the slight ion exchange properties of cellulose are brought into play.

Chemists' Salary Scales

Minimums Recommended by the BAC

CAREFUL consideration has recently been given by the British Association of Chemists to questions of minimum salary scales for chemists and chemical assistants and a list recently compiled by the association represents the rates which chemists can expect to receive.

Adequate remuneration is essential to satisfactory service. The association keeps a regular check on large numbers of advertisements concerning chemical posts, and although the majority conform reasonably satisfactorily to the scales recommended, there are still a few which mention figures considerably below these rates.

The scale of minimum salaries for chemists and chemical assistants, irrespective of sex, recommended by the BAC is as follows:

Senior Chemists.—Salaries vary considerably according to responsibility and experience from £1,000 to £1,500 a year, upwards. For such posts individual agreements of service are more appropriate. It is suggested that all such agreements be submitted by members to the BAC before signature. Free legal advice is provided covering this and other aspects of professional work.

Qualified Chemists.—Minimum salary £650 a year for which the following qualifications are necessary: Full member of BAC; two years' post-graduate experience plus one of the following: honours degree in chemistry, associateship of the Royal Institute of Chemistry, or equivalent such as A.R.C.S. (London), A.R.T.C. (Glasgow), A.M.C.T. (Manchester). Age 25 years. Minimum salary of £550 a year. Any of the above qualifications but without any post-graduate experience and/or below 25 years of age. Increments of at least £50 a year in both cases.

Chemical Assistants.—Minimum salary of £450 a year for which qualifications are: Associate member of BAC; four years' experience as junior or laboratory assistant subsequent to obtaining one of the following qualifications: Inter.B.Sc., Ordinary National Certificate in Chemistry, Higher School Certificate. Age 21 years. Minimum salary £350 a year. Any of the above qualifications but with less than four years' subsequent experience or less than 21 years of age. Graduates possessing a pass or ordinary degree entering this grade, or assistants on graduating B.Sc. while in this grade should receive an additional £50 a year. Annual increments in both cases should not be less than £30 a year.

Junior and Laboratory Assistants.—Junior assistants should normally have passed Matriculation, School Certificate or equivalent examinations in chemistry, physics and mathematics and should be student members of the BAC. Salaries range from £156 a year aged 16, to £299 a year, aged 21. For laboratory assistants the salary scale rises from £325 a year aged 22, to £416 a year aged 26 years. Junior and laboratory assistants qualifying for Intermediate B.Sc., Ordinary National Certificate in Chemistry, or Higher Schools Certificate, should receive 20s. a week (£52 a year) above these rates while remaining in this grade, and should receive promotion after another four years.

Facilities for part-time education during the day-time (eight hours a week, with pay) should be granted to all junior assistants under 21 years of age. Many firms extend this privilege up to the stage of obtaining a degree or A.R.I.C. Evening studies will usually be necessary as well.

Developing Mexican Sulphur

THE Export-Import Bank of Washington has just approved a loan of $1,875,000 (£618,333) to the Mexican Gulf Sulphur Company and its Mexican subsidiary, Mexican Sulphur Company, for the purpose of producing elemental sulphur from its concessions in Mexico. The Bank's loan will be used to pay approximately the dollar cost of purchasing machinery and equipment in the United States. The rest of the capital required will be met from the company's own funds.

The concessions are located in the Isthmus of Tehuantepeo, near the oil refinery centre of Minatitlan. Proven reserves amount to some 1.5 million tons of recoverable sulphur with estimated reserves totalling several millions of tons. It is planned to use the well-known 'Frasch' system. The sulphur so produced will average 99.65 per cent pure. In the initial stage of operations, the company hopes to produce some 200.000 tons of elemental sulphur per year.

Platinum Catalysts in Petroleum Refining

Three Major Types of Chemical Reaction

PLATINUM reforming of petroleum stocks, a commercial development of the past two years, has now reached the status where it may be considered a major process for the improvement of the octane number of petroleum spirits of almost all types. At the same time, it promises to become a major chemical operation, a key process for the production of short-supply benzene from petroleum hydrocarbons.

Most recent development in this field is the Atlantic Refining Company's new catalytic reforming process in the United States. This operation is claimed to produce high-octane petroleum in yields at least three per cent higher than is possible by other refining methods. Work on a 12,500 bbl/day refinery based on this new development is already under way.

The heart of the new reforming process is a platinum-based catalyst of undisclosed formulation. In this respect, as well as in processing aims to be accomplished, the new process much resembles Universal Oil Products' new platforming process which has a two years' head start in commercial realisation.

At least three other major oil companies are known to be carrying on research along similar lines to utilise the ability of properly formulated platinum catalysts. With these it is hoped to obtain high-quality petroleum of outstandingly high yield in a process characterised by remarkable simplicity and mild operating conditions.

Promises to Become Basis

Thus platinum, long employed by the chemical industry for oxidation and mild hydrogenation catalysis, now promises to become the basis for major catalytic reforming processes in petroleum industry.

Both Atlantic's and U.O.P.'s processes resemble somewhat the more conventional hydroforming operations. The reaction is carried out in the presence of hydrogen under pressure (300-700 p.s.i. in Atlantic's process, 750 p.s.i. in platforming). Operating temperatures in both processes vary between 850 and 1,000°F., depending on the feedstock and on the aims to be accomplished.

The presence of hydrogen suppresses the formation of heavy carbonaceous by-products which would tend to coat the catalyst and destroy its activity. By proper operation, the formation of high-boilers can be avoided altogether and the purification of the reactor product is thus greatly facilitated.

Long Active Life

This ability to prevent the formation of catalyst deposits results in exceedingly long active life for the catalyst (probably in excess of one year). As a result, regeneration operations, which plague catalytic cracker design and reduce plant output, are completely eliminated. When, after a considerable period on stream, the catalyst's activity finally decreases dangerously, the most economical procedure is to exchange the catalyst charge.

As yet, it has not been established whether a spent platinum catalyst charge is at all regenerable. But, in any case, it will suffice for economic operation to recover contained platinum. In this case, the refiner should be given full credit for contained platinum by the catalyst manufacturer.

Normal charge to the platinum reforming processes may be any fraction of crude naphtha up through normal petroleum end point, as well as natural petroleums, and mildly thermal cracked petroleum spirits. The presence of reasonable amounts (say, about 0.1 to 0.2 per cent) sulphur in the feedstock is of no significance on the smoothness of operations. Herein, too, the process serves the refiner's ends and reduces sulphur content to a residual 0.004 per cent and even less by converting it to readily removed hydrogen sulphide.

Three major types of chemical reaction are involved in the platinum reforming process:

Isomerisation will convert five-membered rings to six-membered structures which can be subsequently aromatised in the converter (for example, dimethyl cyclopentane is isomerised to methyl cyclohexane, which can be subsequently dehydrogenated to toluene). At the same time, the platinum catalysts exhibit remarkable activity in the conversion of paraffinic hydrocarbons to the more desirable branched-chain isomers.

Of particular importance are the aromatising *dehydrogenation* reactions (for example the conversion of methyl cyclohexane to

toluene indicated above). This reaction is particularly rapid and of great significance in raising the octane number of the reformate. Of further significance are the petrochemical aspects involved in the formation of large amounts of recoverable aromatics for use in the plastics, rubber, and chemical industries.

Main Determining Factors

Dehydrogenation reaction occurring in any given raw material is largely determined by the hydrogen-pressure and operating temperature involved. The reaction is limited by considerations of thermodynamic equilibrium. The application of hydrogen pressure tends to favour the presence of naphthenic components in the product. To counteract this tendency, it is therefore necessary to boost the temperature to a level where aromatisation predominates.

Here, too, a strict limit is set by the need to avoid a temperature range where pure catalytic guidance of the chemical reactions involved is encroached upon by purely thermal phenomena, with consequent reduction in yield, formation of high-boilers, and catalyst destruction. It is considerations of this nature which mainly determine the operating conditions in the catalyst zone.

The third reaction involved in platinum reforming is referred to by Haensel, of Universal Oil Products, as *hydrocracking*. This is a simultaneous cracking, isomerisation, and hydrogenation, which will result in the formation of wholly saturated molecular breakdown products from paraffinic cracking.

In normal cracking, for example, decane might be converted to one molecule of pentane, and another of pentene. In the present process, the pentene is immediately saturated and two molecules of alkane (pentane in this case) are formed. Thus, the presence of olefinic structures in the reformate is kept at an absolute minimum, and the stability of the resultant gasoline is thereby enhanced.

The first two reactions are predominant in the overall picture. Typical platinum reforming performance is illustrated in the accompanying table which embodies results of Atlantic's new process:

Change effected in Raw Gasoline

Component	Proportion before reforming per cent	Proportion after reforming per cent
Aromatics	10	50
Naphthenes	40	4
Isoparaffins	25	28
Paraffins	25	18

The process will easily boost the clear octane number of the stock by 30-40 and even more points. Volumetric yields of 91 to 96 per cent are not uncommon. At the same time, a substantial reduction in sulphur content of the majority of feedstocks will result in increased lead susceptibility.

Because of the great predominance of the endothermic over the exothermic hydrocracking reaction considerable quantities of heat must be added to the converter. Because of the costly catalyst employed, a fixed-bed reactor must be employed. This combination of operating dictates results in a preference for carrying out the platinum reforming reaction in two or three reactors in series. Tubular heaters are provided between reaction stages in order to supply the required heat of reaction as sensible heat.

Hydrocarbon feedstock is joined by a stream of recycle hydrogen preceding either the first reactor stage proper, or the feed preheater coil which must be provided to raise the stock to reaction temperature.

After passage through a succession of two or three heaters and reactors, the reformate-gas effluent is cooled in countercurrent heat exchange with the incoming stream and finally with water. The condensate is stabilised, since relatively small amounts of hydrocarbon gases are unavoidably formed. Formation of higher-boiling hydrocarbons is negligible and an after-fractionation is obviated.

Appreciable Hydrogen Credit

Non-condensible gases contain predominantly hydrogen (85 per cent or better purity), together with smaller amounts of methane and ethane. A portion of this gas is recycled to the process to provide the required hydrogen pressure. The overall balance of the process shows, however, an appreciable hydrogen credit, and a portion of the effluent gas is therefore continuously bled off.

A platinum reforming installation already in operation (for example, at Old Dutch Refining Co., at Muskegon, Mich.), the hydrogen-rich bleed gas is used for fuel purposes. An important potential is, however, seen in the utilisation of this by-product gas for chemical purposes, *e.g.*, in the production of ammonia.

Another significant potential for this gas, which is of more direct importance to the petroleum industry is its utilisation for high-pressure hydrogenation for upgrading such heavy stocks as thermal cracking residues.

New Laboratory Section Opened

Laporte Chemicals Build New Floor

ON Tuesday, 8 May, at Luton, Laporte Chemicals, Ltd., held a ceremonial opening and cocktail party to celebrate the completion of their new laboratory section built on to the original laboratories on the ground floor. This floor has been only just over one year in construction and Laporte have extended their existing laboratory floor space from 11,000 to 32,000 sq. ft., and their laboratory staff from the original 40 to over 100. Also new is a large building for experimental plant work.

At an extensive preview Laporte officials conducted the Press round their new premises, apologising meanwhile, quite unnecessarily, for the somewhat dirty state of the laboratory previous to the official opening. The new laboratories were not at all dirty and, in fact, research in some of them was actually in progress.

Physico-Chemical Laboratory

One of the most interesting was the new physico-chemical laboratory. The company, specialising in the production of titanium dioxide and other pigments, needs research into colloid and fine particle chemistry, and one of the instruments developed by the company themselves analyses the crystal structure of different pigment allotropes in a matter of minutes. At a vivid demonstration we were shown how this instrument differentiates between the titanium dioxide modifications of rutile and anatase. An X-ray beam directed at the correct incident angle strikes a small container of the pigment, and the diffracted rays pass directly through a comptometer. Much the same as in the reflection method of β-ray analysis, the two forms of the dioxide reflect the beam at different angles, and the number of particles reflected at each angle are added up and the total presented automatically at the end of one minute on the comptometer, showing the percentage of each modification present in the samples by means of a computor.

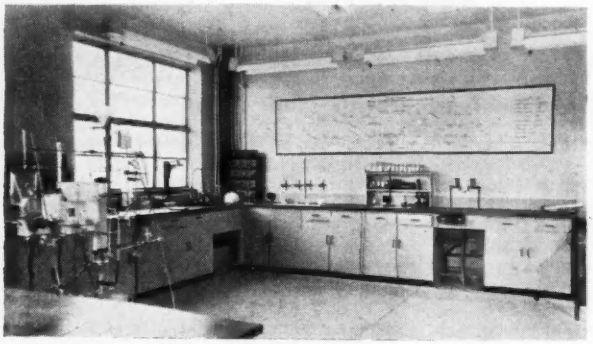
The electrochemical department is equipped with small-scale cells which are models of larger works units. 'Perspex' being much in use here to facilitate study. Electronics also occupies a separate laboratory, as well as corrosion and storage investigation, two important aspects of manufacture which are receiving more attention from chemists nowadays than they have previously. The analytical research department boasts two laboratories, as well as an instruments room containing a spectrograph, a cathode-ray static-trace polarograph, and other physical instruments.

Others of the 42 laboratories in the building include a textile department and an experimental plant laboratory. One textile laboratory is to be used for research into the problems of fibre chemistry bound up with bleaching, detergency and finishing, and the second laboratory, a room faintly resembling a laundry, is fitted up with an experimental kiln, pressure bleaching machine, hank bleaching machine and other plant.

The experimental plant laboratory is a large one, with a floor space of 6,000 sq. ft. and a maximum height of 34 ft. A gallery runs round two sides of the building at a height of 10 ft. to enable tall equipment to be set up, and aluminium tubular scaffolding is widely used, as well as industrial glass pipelines and vessels and a range of plastic ware. This laboratory is an essential link between research laboratory and factory.

The paint laboratory is equipped with the usual ball mills, etc., and facilities for investigating the properties of pigments, and one laboratory is devoted to research into barium compounds, which the company produces from their barytes mines in Devonshire. Other general research laboratories include one specialising in the development of hydrogen peroxide, the company's main product, and one in research on organic peroxides for such uses

The completed laboratory building



The barium laboratory, showing at the end a chart which demonstrates the processes involved in the production of barium compounds and sulphuric acid

as bleaching flour. There is also a handsome library in the building, with a micro film projector installed for reading photostats, as well as a conference room and a photographic department for both the reproduction of documents and the photographic recording of experiments.

Special features of the laboratory are that the mains run through the roof space and round the outside walls, so allowing modification without disturbing the whole work of the laboratory, and that all the laboratories are fited with mobile, easily adaptable benches which can be readily moved about. A very generous fume extraction system not only removes noxious fumes from the fume cupboards, but also ventilates the laboratories as a whole. The laboratories are fitted with fluorescent lighting.

The activities of Laporte Chemicals cover several related fields. Originally located in Luton for the express purpose of using their hydrogen peroxide for bleaching the straw hats which were so popular several years ago—the process they found had marked advantages over the sulphite bleach—they have remained there long after the straw hat has gone out of vogue. Peroxide has not gone out of fashion, and as the barytes from which they used to make it is now a valuable source of barium compounds, from which also, as 'blanc fixe' they derive titanium salts, another recent claimant for industrial favour, these two sidelines have been fully developed. In addition, sulphur compounds, detergents, sodium sulphide, hydrochloric acid and baking powders are a speciality with the company. Their new laboratories should make a valuable contribution to production efficiency.

At the opening on Tuesday, Mr. V. W. Slater, technical director, congratulated everyone concerned on the completion of the new laboratories. The company, he said, had a very active research staff that had more than earned these more extensive premises in which to carry on their valuable work.

Due to continual improvements in the processes involved in the manufacture of hydrogen peroxide, their principal product, said Mr. Slater, the company had managed to maintain it at the same price for the last seven years—no mean achievement—and this in the face of forever rising labour costs, equipment costs, overheads and the cost of raw materials. Mr. Slater warned, however, that further rises in costs might compel the company to raise their prices.

The ceremony of cutting the ribbon at the bottom of the new staircase was performed by Mrs. Slater, who expressed her great pleasure in so doing and wished all luck to those who would use it in the future. Following this the guests were conducted on a short tour of the new laboratories, during which the staff in charge of the laboratories demonstrated the functions of their various machines and instruments to good effect.

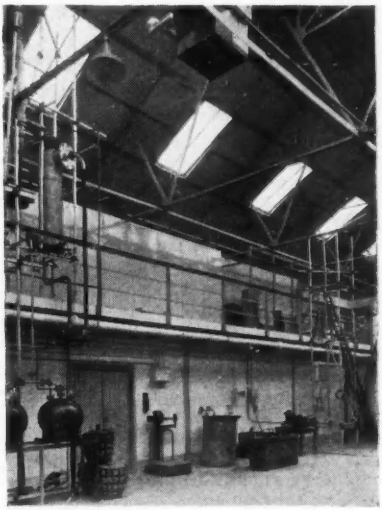
After the tour, the company adjourned to an informal cocktail party held in the unfinished wing of the new building (this is beng left for future developments). The chairman of the board, Mr. L. P. O'Brien, in a few words, emphasised the importance that the company placed on the research department, and said that a great deal depended on having a capable body of research workers on the premises. He then asked Mr. John Davidson-Pratt, C.B.E., M.A., president of the B.C.M.A., and an

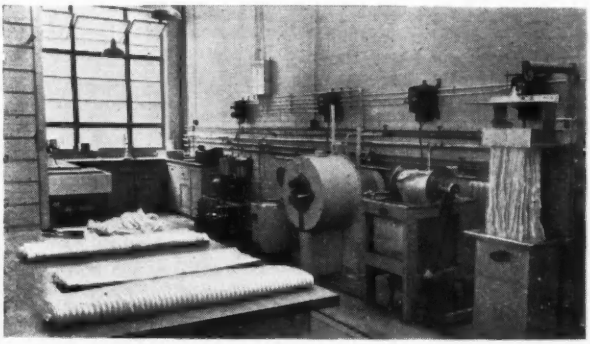
'honest Scot', who was present, to say a few words.

Mr. Davidson-Pratt made an amusing speech, saying that there weren't any 'honest Scots', but that he appreciated the compliment. Speaking about the new research laboratories, he remarked that he could think of four distinct advantages of having a research department: (1) it did no harm; (2) it made the shareholders very impressed to have all this science about; (3) it gave a lot of scientific people work to do who might otherwise get up to all sorts of mischief; and (4) statistically speaking, it must, in time, result in an improvement in technique for the company. There was only one disadvantage, said Mr. Davidson-Pratt, and that was cash, but he was glad to report that the board of Laporte Chemicals and all its associated companies was not the kind that minded a little thing like that.

Speaking seriously, though, he said that he thought it an excellent thing that the company did place so much reliance on research, and it gave him very great pleasure to be present at this momentous occasion for Laporte Chemicals. He wished them all the very best.

Thanking Mr. Davidson-Pratt for his good wishes, Mr. Slater concluded the speeches with a short tribute to all who had helped them in the past with their research problems, and to all those who had helped to build and equip the magnificent new premises. The laboratories would, he hoped, enable the company to advance still further towards the goal of better and cheaper products, and he wished all the best to those who would work in them.





Above: Pilot plant testing room

Left: The textiles laboratory

KID Exemptions

The following chemicals have been exempted from Key Industry Duty for the period 7 May to 19 August, 1951: *p*-aminophenol, dibenzthiazyl disulphide, dibutylamine, dimethyl sulphate (a methyl ester), *n*-heptaldehyde, lactic acid, mercaptobenzthiazole, *p*-methylaminophenol sulphate, nicotinamide, *p*-nitrophenol, *iso*-propylamine, R. sodium sulphite, sodium thiosulphate (photographic quality), *p*-toluidine. The Order is The Safeguarding of Industries (Exemption) (No. 5) Order, 1951, published as Statutory Instruments 1951 No. 769.

New Naphtha Plant

Problems for the Chemical Engineer

CONSTRUCTION of the works at Carrington, with a designed capacity of 75,000 tons a year of petroleum naphtha, was described by Mr. H. Charlton in a paper 'Chemical Engineering as Applied to the Building of a Petroleum Chemicals Plant' read to the North-Western Branch of the Institution of Chemical Engineers at its last meeting of the session held on 28 April, at the College of Technology, Manchester. Mr. G. Brearley, chairman of the branch, presided.

Maximum Standardisation

Maximum standardisation of equipment and all possible short cuts to satisfactory solutions of problems, drawing and construction were employed. Continuous operations and rectifications were adopted to reduce the time the heat-sensitive materials were in process. The 'Catarole' process of vapour phase cracking of petroleum naphtha at 700°C. in alloy-steel tubes yields a liquid containing much aromatic hydrocarbons and a gas containing ethylene, propylene and butylenes.

Heat requirements for cracking were calculated and the temperature of the reaction zone is kept constant by re-cycling flue gas from the radiant heat, oil gas-fired furnace. Products are cooled by water and the mixture separated into vapour and heavy liquid in a tar separator, then in gas coolers to separate more liquids from the gas. The gas is purified by caustic soda solution to remove hydrogen sulphide and is separated into its constituents in a low-temperature, low-pressure plant with many refrigeration cycles.

In this low-temperature plant the gas is compressed and dried, then is cooled to produce a gas containing a negligible amount of ethylene and a liquid which is distilled in the first column, where methane is taken off as top product. The bottom product is fed to the second column where ethane and ethylene are overhead products and serve as feed for column three in which ethylene is separated from ethane at an average temperature of −90°C. The bottom product from column two contains the C_3s mixed with higher Cs and is sent to column four for the removal of C_3s then to column five for the removal of C_4s.

The coolers of this section of the plant and the first three columns are assembled in an insulated sealed box to conserve cold. The gases thus separated are used to produce chemicals by conventional processes which were described. The liquid products are distilled to produce three crude fractions which are re-distilled and further treated.

Reagent or nitration benzene and toluene are distilled alternately with xylene from one fraction while naphthalene is crystallised and centrifuged from another fraction. The alkyl benzene fraction yields resins which are useful in the paint industry.

As distillation was the principal method of separation of products of the 'Catarole' process, two sizes of standard, die-cast aluminium bubble caps were used for many of the 27 fractionating columns. A piston-ring type of cast aluminium plate was used in small diameter columns made of ordinary pipe. Details of the design of re-boilers for columns and of the control of reflux were stated. The design of cooler-condensers for the products from the cracking plant was the most difficult heat transfer problem and the influence of the film of condensed liquid and of the reduced gas flow on the heat transfer coefficient was shown.

Helical-coil heat exchangers of the cross counter-current type permitted a large surface to be packed into a small space, and were suitable for gas-gas heat exchange in the gas separation plant. As petroleum naphtha contains no compound containing oxygen, much plant could be made of mild steel. Stainless steel was used in the polystyrene plant to avoid contamination of the product. Details of the use of other constructional materials and methods of transportation were given.

Mr. Clifford Hobson

It is with deep regret we have to announce that Mr. Clifford Hobson recently passed away at his home after a long illness. Mr. Hobson was in his 57th year.

Former representative of The Dowson & Mason Gas Plant Co. Ltd., and later manager of the Pump and Tank Department, which position he held up to the time of his death, Mr. Hobson had formed many friendships during his 32 years' connection with the motor trade, transport and oil industries.

Overwhelming Nickel Superiority

Canadian Production Gives Free World Big Advantage

INSTALLATION of emergency facilities by the International Nickel Company of Canada, Ltd., to increase nickel production by about 1,000,000 lb. per month, beginning before the year-end, was disclosed in Toronto, Ontario, on 25 April by Dr. John F. Thompson, chairman and president, at the annual meeting of shareholders at the Royal York Hotel. Present production is at capacity of 20,000,000 lb. per month.

Reviewing the world nickel situation, Dr. Thompson said 'the defence requirements of Canada, the United Kingdom and the United States are supported by a supply of Canadian nickel which far exceeds the supply believed available to countries behind the Iron Curtain. In fact it can be said that as a result of what the Canadian nickel industry has done in developing its mines and processes, the free world has overwhelming nickel superiority.' Although all military requirements of the Western Nations are being met and deliveries are being made o national stockpiles, he said, the abnormal overall demand has exceeded the current nickel supply.

Moreover, he added, the 'current inflated demand for nickel has come when we have no new surface deposits such as the Frood-Stobie open pits which can be called upon for additional output.' Accordingly, the company's emergency programme will provide increased production of 5 per cent, while its long-term programme of conversion from surface and underground mining to all-underground mining will double the amount of underground ore hoisted annually in the past, so as to preserve the current rate of production of nickel. By 1953, the company, in capacity operation, will be able to hoist about 13,000,000 tons of underground ore annually, which, Dr. Thompson noted, is equal to three-quarters of the total amount of copper ore hoisted from underground operations in 1949 by all mines within the United States.

To Design Pilot Plant

Reporting on the company's defence production, other than refined nickel, copper, platinum metals and other metallic elements, Dr. Thompson told the shareholders that International Nickel 'has entered into arrangements to design a pilot plant at Huntington, West Virginia, for the account of the United States Atomic Energy Commission. These Government-owned facilities will be leased to and operated by the company.'

Emphasis Changed

In respect to production at the company's rolling mills in the United States, England and Scotland, he said that whereas during World War II many of their products went into ships for a two-ocean navy, 'emphasis has now been directed to jet plane production.' This has produced a corresponding shift in the types of alloys coming from its three rolling mills in the direction of the unique high-temperature-resisting alloys presently required. Current jet engine models need two or three times the nickel ordinarily found in reciprocating engines (said Dr. Thompson); and part of this nickel is contained in the Inconel and Nimonic alloys which the company's rolling mills are producing in increasing quantity, while part of it forms an important element of the heat-resisting stainless steels and other alloys produced by customers' mills for vital components of jet planes.

Dr. Thompson continued: 'Our rolling mills are established at locations which enable us to serve properly the widely differing needs of thousands of United States and United Kingdom customers and to exploit thereby most effectively the opportunities for Canadian nickel in the field of high nickel alloys. The location of these plants is of the utmost importance, in fact fundamental to their success'. Unless they were located so as to permit the closest of communication with and of deliveries to their customers, they could not operate under modern conditions, when a mill or foundry must be immediately responsive to a customer's need for small but essential changes of any product and for the most rapid delivery.

'High nickel alloys produced in the company's plants are only a fraction of the nickel-containing alloys produced by industry generally and available for military and civilian use', Dr. Thompson said. 'One of the largest outlets for nickel is in stainless

steel. More than 800,000 ingot tons of stainless steel were produced in the United States in 1950, an all-time peak.

'Alloy steel ingot production in the United States was about the same as in 1948 and over 40 per cent larger than in 1949. The growing need for nickel in defence applications has led to conservation measures in the form of significant changes in the metallurgical pattern of alloy steels for civilian requirements. The use of more complex alloys with lower nickel content is growing and users of standard nickel alloy engineering steels are now using these substitutes for a portion of their requirements.'

Referring to work in process or recently completed in connection with the programme of underground mining expansion, Dr. Thompson noted that, to date, some $100 million (£33,333,333) has been spent, chiefly on this programme. To handle lower-grade ores at Creighton Mine, a new shaft is being completed and a 10,000-ton mill has been erected from which the concentrates are pumped 7½ miles to the Copper Cliff reduction plant. The Murray Mine was brought into production in 1950, and a new major portion of the Frood-Stobie underground mine—the Stobie section—will be brought into production as the programme progresses. Shafts at the Levack, Garson and Murray Mines are being deepened. A 300 ton-per-day oxygen generating unit and a new copper concentrate smelting furnace should be completed before the end of this year.

Plastics Industry Hit

Need for More Sulphur Stressed

ONE of Britain's largest manufacturers of plastic goods, the Rosedale Group of Companies, recently held a Press conference at which the managing director, Mr. Norman Rosedale, outlined the difficulties now besetting his firm and others like it. Briefly describing the growth of the Group, Mr. Rosedale gave some facts to justify his claim that the British plastics goods industry had contributed in no small measure to Britain's export trade and to this country's prosperity. Since last year's B.I.F., he said, his firm alone had sold over 15,000,000 toys and 10,000,000 combs as well as a similar number of other plastic products.

In expressing the opinion that the plastics industry should be assured of a fair share of the sulphur available, Mr. Rosedale said:

'The situation now is that we are being deprived of much of the raw material which would enable us to help our country achieve a favourable balance of trade. Our basic raw material is cellulose acetate, a by-product of the cotton industry. It consists of the short strands of the cotton plant that are not long enough for spinning. When treated with sulphuric acid they form the basis for our moulding powders. The preparation of these powders involves the use of plasticisers which again require pure sulphur in their manufacture. In fact, next to the rayon industry, we are probably most hard hit by the sulphur shortage.

'Mr. Gordon-Walker, Secretary for Commonwealth Relations, has stated that dollar-earning exports must be given the highest priority. All we ask is that we should have adequate supplies of cellulose acetate and plasticisers, with which to maintain exports and to avert unemployment in those areas of the country in which plastic goods are made.'

Canadian Detergent Plant

CHEMICAL Developments of Canada, Ltd., began producing non-ionic surface active agents at the end of January at their recently completed Langford, Ont., plant. At the new plant, petroleum base and coal tar raw materials are treated in an atmosphere of nitrogen, to produce complex polyoxyethylene condensation products with outstanding properties for wetting, spreading and reducing surface tension. These new synthetic detergents are said to be unaffected by hard water (caused by calcium or magnesium salts) and stable to concentrated acid and alkaline solutions. As liquid household detergents they will remove grease even in cold water.

These surface agents are used widely in bottle-cleaning, metal-degreasing, pickling operations, pulp washing, wool scouring, and in compounding built, heavy-duty detergents and soaps that are completely dispersible in hard water. In the insecticide industry the non-ionics are much used as emulsifiers and as proven valuable replacements for petroleum sulphonates in the preparation of cutting oils that are readily emulsifiable in water. Their wetting properties are employed in making wet-water to combat fires and to settle dust in mining operations.

The Festival of Britain

Science and Chemistry on South Bank

BRITAIN'S contribution to world civilisation in the arts of peace—in the past, the present, and with a preview of the continuing future—is the theme of the Festival of Britain being held on a nationwide scale to mark the centenary of the Great Exhibition of 1851.

At the heart of the activities, which will cover science and technology, the arts, architecture, industrial design and production, and sport, lies the exhibition on the South Bank of the River Thames, officially opened on 3 May by the King.

Chemistry has probably made greater advances in the last 100 years than at any time since the chemical revolution of the 18th century. At the Great Exhibition, chemical products were prominently displayed to reveal 'a strikingly beautiful application of science.'

The impact of chemistry on life is, however, today realised to be so complex that it is impossible to confine it to any one building. Chemical raw materials, products, research and its application to industry and medicine, can therefore be found in many of the pavilions which illustrate the narrative theme of the Land and the People of Great Britain.

First reference to the chemical industry is in the 'Land of Britain' pavilion, which shows how the salt, on which so many processes are based, was formed in North-East England. Passing on to the 'Country' it can be seen how the aid of science has been increasingly sought in modern agriculture. Britain's contribution in this respect has been outstanding, beginning with the work carried out by Lawes on fertilisers at Rothamsted over 100 years ago.

Minerals on Show

Coal and metals, vital necessities to the chemical industry, occupy the ground floor of the pavilion devoted to 'Minerals of the Island,' while the upper galleries contain some of the major chemical raw materials—salt and sulphur; silica and limestone; air and water.

Native skill and the minerals of the island made Britain the first workshop of the world. In the 'Power and Production' building one gallery is devoted to metals and shows the various processes of rolling, forging, extrusion wire drawing and casting. Examples of the contributions made to industry by the Research Associations are shown in the other gallery from such widely different subjects as dyestuffs, footwear, metals and flour. Processes in production are illustrated by displays of woodworking, rubber and plastics, glass, textiles, pottery and the story of paper-making and printing.

Giant Telescope

In the vast 'Dome of Discovery,' as is to be expected, the various sciences—chemistry, physics, biology, medicine, astronomy, and so on—are all skilfully interrelated, with the giant 74 in. telescope for Mount Stromlo, Australia, making a striking centrepiece. The mirror, cast in this country, is made of special glass, weighs two tons and is 12 in. thick. The moving parts of the instrument weigh 20 tons, but are so finely balanced that it can be moved by the slightest touch of the hand.

The telescope can 'follow' continuously any chosen star. This movement is controlled by a wormwheel of 8 ft. diameter, the teeth of which are cut so accurately that the telescope could be pointed exactly at a moving object the size of an orange 20 miles away.

Pest control and tropical medicine both owe their debt to chemical research.

In the 'Physical World' section the story is told of those who have explored inside Nature to discover how matter is made and what natural laws govern its behaviour.

The chemical sequence shows how such men as Boyle, Black, Cavendish, Priestley and Dalton added to our knowledge of the structure of matter and how the conception of atoms, molecules and elements arose. The story then passes on to the ways in which various substances can combine together to produce materials quite unlike any of their constituents.

Such knowledge enables the chemist not only to produce such combinations at will, but also to make substances that do not occur in Nature. This synthesis is the highlight of modern chemistry and has already produced sulpha drugs, paludrine and vitamins for preserving the health of mankind.

rayon, nylon, terylene, and plastics for a variety of industrial applications.

Discoveries of British physicists have had far-reaching results. One of the outcomes of Newton's genius has ultimately been the jet engine; Faraday's experiments with a magnet and some coils of wire made electric power possible, and Rutherford provided the means for releasing nuclear energy. Investigations of physicists and chemists have indeed led to technical advances in many other directions.

Pioneer work in nuclear physics was done in Britain, though the development of the atomic pile, as such, has been largely an international achievement. The displays of this subject, which form the conclusion of the 'Physical World' section, do not embark on any speculation about future marvels; they do show, however, some of the applications that are being developed at the present time.

This great field of exploration has affected the lives of us all and continues to provide new means and devices by which exploration in other fields can be intensified, so that the horizons for human endeavour will continue to expand.

Finally the last impact of chemistry on everyday life is seen in the 'Health' pavilion with its influence on safe water, good drainage, purification of the atmosphere, and proper foods. Probably the most important work of the present century in clinical medicine was the discovery by Fleming and Florey of penicillin which has stimulated the search for similar therapeutic substances.

New Transparent Coating

To Protect the Dome of Discovery

NOT all of Britain's most remarkable discoveries will be housed under the Festival Dome. The vast hundred thousand square feet Dome of Discovery's aluminium roof will itself be protected against discoloration, as will the 290 ft. Skylon, with a newly developed transparent lacquer, Tretol Chemiprufe, made by Tretol, Ltd. Exhaustive tests have satisfied the experts that this almost invisible coating will provide the most effective protection against London's grime-laden and corrosive atmosphere, and keep both landmarks bright. Its use on these provides striking proof of the possibilities of this clear gloss lacquer. Designed for use on aluminium, copper, and metals which are not usually painted, as well as a glaze overcoating to other metal surfaces painted with Tretol Chlorinated Rubber Paint it provides a high degree of protection against industrial atmospheres, brine, acids and alkaline vapours, effectively preventing discoloration of unpainted surfaces. It can be brushed or sprayed and—an important advantage—is touch dry within an hour of application and hard in 24 hours. Being a new product, the makers are naturally chary at the moment of divulging many technical details, and limit themselves to saying that it can also be used for proofing concrete, asbestos and brickwork against moisture penetration, and that it is flexible as a film and resistant to mechanical abrasion as well as chemical. All metals can be painted with it, its main purpose being to provide a tough, transparent, glossy film, and even ordinary paint can be overlaid with it, although this is not so good as with the company's own special chlorinated rubber paint designed for its use. 'Chemiprufe' would appear to have great potentialities.

Automatic Control Conference

FROM 16-21 July, 1951, a conference on Automatic Control is being held at the College of Aeronautics, Cranfield, near Bedford, under the auspices of the Department of Scientific and Industrial Research. The conference has been called for the purpose of an informal exchange of views and experience between leaders of thought in the various branches of the subject, and to cover the most recent advances in the whole field of automatic control, ranging from research work on fundamentals on the one hand, to industrial applications in process control on the other. Leading workers from European countries and U.S.A., as well as from Great Britain and the Dominions, are expected to attend and to present papers.

The conference will be formally opened by the president, Sir Ben Lockspeiser, K.C.B., F.R.S., secretary of the Department of Scientific and Industrial Research, and papers will be read to the conference by a number of members. The meetings will be split into four sections. 'General Theory and Optimisation'; 'Process Control'; 'Non-linear Problems'; and 'Systems Working on Intermittent Data.'

PERSONAL

In July 1950, the Royal Society of Arts, as part of its celebrations of the centenary of the Great Exhibition of 1851, which it originated, and as a constructive effort to assist the nation in its present difficulties, offered a prize of £500 and a gold medal for 'a means of promoting the production or the economic utilisation of food in Britain.' 115 entries were submitted and on the unanimous recommendation of the judges, the Council of the Society has awarded the prize to ROLAND EDGAR SLADE, M.C., D.Sc., F.R.I.C., of Bishop's Stortford, Herts.

Dr. Slade is now a farmer but he was Controller of Research for Imperial Chemical Industries, Ltd., from 1935 to 1945. He submitted a scheme for two systems of farming, one for grassland and the other for arable land.

* * *

MR. ADAM MELDRUM, Aberdeen, president of the Pharmaceutical Society of Great Britain, has left London by air for Australia to attend the biannual meeting of the Pharmaceutical Association of Australia and New Zealand in Brisbane.

* * *

Honorary membership of the Institution of Mining and Metallurgy has been conferred on SIR HENRY TIZARD in recognition of his outstanding services to science, industry, and education. SIR ANDREW BRYAN, Chief Inspector of Mines, is also made an honorary member for his services to the mining industry.

* * *

Among the guests who attended the ceremonial visit of the King and Queen to the South Bank Exhibition of the Festival of Britain on 4 May were MR. KENNETH HALL, chairman of the Aluminium Industry Council, and MR. AUSTIN REYNOLDS, president, AIR-COMMODORE W. HELMORE, director-general, and DR. E. G. WEST, technical director of the Aluminium Development Association.

British Carbon Black Plant

PRODUCTION has been started in the first section of its carbon black project at Avonmouth by Philblack, Ltd. The plant, designed to have a productive capacity of 50,000,000 lb. a year (THE CHEMICAL AGE, *61*, 177), will supply two grades of carbon black.

The plant, which has now been continuously on stream since the beginning of the month, is for the production of Philplack O grade with a capacity of 30,000,000 lb. a year. It is hoped that the further plant for production of Philblack A with a capacity of 20,000,000 lb. annually will be ready to come into operation in the near future.

Started in 1948 under the auspices of Dawnay Day and Co. the project employs the technical processes of the Phillips Petroleum Co., of Oklahoma, U.S.A. Engineers began work on the site in May, 1949.

Norway's Sulphur Exports

Norway last year exported 76,162 tons of sulphur. Only about 25,000 tons, or about a quarter of the total Norwegian production of sulphur, were retained in the country, mostly for use in the paper industry. Up to now nearly the whole of Norway's sulphur export has gone to Finland and Sweden, and in reply to a newspaper inquiry the Norwegian Ministry of Trade states that also this year most of the sulphur will go to those two countries, according to contracts long since entered into. Total production in Norway this year is not expected to exceed last year's total of about 100,000 tons. Apart from the export of sulphur, Norway last year exported 389,066 tons of sulphur pyrites, of which most went to Western Germany, Sweden, Denmark, and Eastern Germany. The total production of sulphur pyrites in Norway last year was 749,363 tons compared with 247,465 tons in 1945 when the war ended, but compared with slightly over 1,000,000 tons in the years just before the war.

Canadian Cobalt Mine

Silanco Mining and Refining Co. has newly opened its Aguanico mine in the Cobalt, Ontario, region as a straight cobalt operation. The company is also taking steps to increase the capacity of its Colonial mill from the present rate, to handle the expected tonnage. The Aguanico mine in the past has produced over 7,000,000 lb. of cobalt and has a present indicated reserve of 400,000 lb. Further exploration is to be undertaken.

HOME

Salters' Grants-in-Aid

The Committee of the Salters' Institute of Industrial Chemistry in July will allocate a limited number of Grants-in-Aid to young people of either sex who are employed in chemical works in or near London who desire to improve their education so as to make a career in the chemical industry.

Applicants must be 17 years of age or more and must have matriculation or its equivalent. Applications should be made as soon as possible and the necessary forms can be obtained from The Clerk of the Salters' Company, Salters' Institute of Industrial Chemistry, 36 Portland Place, London, W.1.

The completed application forms must be returned to the Clerk before 25 May, 1951.

Dr. David Traill

In our issues of 28 April and 5 May (on pages 681 and 713 respectively) we referred to Mr. David Traill as being a director of I.C.I., Ltd., whereas we should have referred to him as a director of the Nobel Division of I.C.I., Ltd.

The Acid Test

A demonstrator on the Olympia (BIF) stand of Innoxa Laboratories attracted considerable attention by plunging his hands into a glass bowl full of concentrated hydrochloric acid. While a piece of zinc slowly dissolved in his hands the demonstrator's hands were removed unscathed. The operator was showing that his firm's B.Q.N. series gives complete protection against acids and alkalis in solution as well as a wide range of other irritants which are soluble in water. Altogether the firm make 15 Innoxa creams and these are said to provide a safe barrier against no less than 350 substances commonly used in a host of different industries.

Patent Office Library

From Monday, 7 May, the Patent Office Library at 25 Southampton Buildings, Chancery Lane, London, W.C.2, will be open to the public from 10 a.m. until 9 p.m., Mondays to Fridays inclusive, instead of closing at 6 p.m. as at present. Saturday opening, however, will continue to be from 10 a.m. to 5 p.m.

Mullard Ltd.

On 1 May 1951, the name of Mullard Electronic Products, Ltd., was changed to Mullard Ltd. The company's products are being distributed throughout the world on an ever-increasing scale and the new name has been adopted in order to associate the company more closely with its trade mark 'Mullard.'

Uruguayan Students' Tour

The British Council has arranged a study tour for a group of 17 students from the Faculty of Chemistry of the National University of Montevideo, under the leadership of Professor Jose Manual Brignoni, the Professor of Industrial Organic Chemistry.

The group travelled to Leeds on 29 April, where they visited the textile, colour chemistry and dyeing, leather, coal-gas and fuel industry departments of Leeds University. On 30 April the group went to Manchester and visited the College of Technology, the plant of Messrs. Simon-Carves, chemical plant manufacturers, and the Dyestuffs Division of I.C.I. After returning to London on 3 May, the group spent a day at the Plastics Division of I.C.I. at Welwyn.

Toxic Chemicals in Agriculture

The Report of a Working Party under the chairmanship of Professor S. Zuckerman, C.B., F.R.S., which was appointed by the Minister of Agriculture and Fisheries to review the use of toxic chemicals in agriculture, was published on Friday, 4 May (H.M. Stationery Office, price 1s. net).

The Report deals with measures to promote the safety of workers handling the dinitro and organo-phosphorus compounds which are being used increasingly in agriculture as weed-killers and insecticides. It makes a number of specific recommendations, some of which involve legislation.

Food Laboratory Moves

The Covent Garden Laboratory of the Food Investigation Organisation of the DSIR is to leave its present premises at 9-13 Kean Street, W.C.2, on 8 May for Inveresk House, Strand, London, W.C.2. The telephone number will remain as at present—TEMple Bar 6156.

OVERSEAS

Chilean Nitrate Industry

Success of the Solar evaporation plants now being installed in the nitrate industry, foreshadows in Chile a heavy chemical industry based on the salts to be obtained by the new process. Improved port facilities at Tocopilla and new electric plants are under study. The new system of nitrate production is expected to enable Chile to meet satisfactorily the increasing competition of the synthetic industry.

Australian Celanese

British Celanese (Overseas), Ltd., have recently purchased a factory site of 273 acres of Crown land at East Geelong, Victoria, Australia, for £A.33,000. A condition of sale is that a sum of £A.100,000 will be spent in five years on improvements. It is planned that the rayon spinning plant will have a maximum production of 3 million lb. of acetate yarn a year. This will meet about half Australia's needs for this type of yarn. The Australian company is considering the manufacture of cellulose raw materials in Tasmania. It is likely that the project in all its phases will require several million pounds for establishment in Australia. Some of the capital may be sought from the Australian public. Key employees will be sent from the U.K. to train local staff.

Australian Changeover

The Australian Minister of Supply, Mr. Beale, recently announced that a complete changeover of Australia's sulphuric acid producing industry is to be made following the decision of the U.S. to cut pure sulphur supplies to Australia. America was not prepared to supply Australia with sulphur and other raw materials if she was unable to receive consideration in her wool requirements. Because of this Australian producers were asked to switch over their plant to produce sulphuric acid from pyrites and zinc concentrates. Mr. Beale pointed out that the Government recognised the urgency of obtaining sulphuric acid for armaments production, industry and the production of superphosphates and other fertilisers, and said it was in the interest of Australia to carry out this changeover as speedily as possible.

Australian Sulphur Project

Several big Australian companies are interested in a project to develop a pyrites deposit at Nairne, in South Australia, for the extraction of sulphur, to ensure supplies of superphosphates for South Australian farmers. The companies are B.H.P. Co., Ltd., Adelaide Chemical and Fertilisers Co., Ltd., Cresco Fertilisers Ltd., and Wallaroo-Mount Lyell Fertilisers, Ltd.

It is proposed to form a company with a subscribed capital of £A200,000, in which the four companies will be equal shareholders. Provision of plant is expected to cost £A800,000; the four companies will each provide £A50,000 towards the general cost, and the State Government will guarantee an overdraft for the balance.

Rhodesian Fertiliser Factory

A new £330,000 fertiliser factory built by Messrs. Fisons (Rhodesia), Ltd., at Aspindale Park, Southern Rhodesia, was opened recently by the Prime Minister, who described the factory as a fine example of the faith Fisons had in the country and its industrial future. Mr. F. G. Clavering Fison, chairman of Fisons, Ltd., Ipswich, emphasised the seriousness of the world shortage of sulphur. The shortage of fertilisers was likely to continue for some years. Mr. John Waller, managing director of the Albatross Superphosphate Works, Holland, said that his company, which went into partnership with Fisons in 1930, and Fisons had a combined turnover in the colony of 30,000 tons of fertiliser a year.

Petroleum Refining in Portugal

The increasing importance of petroleum refining in the Portuguese economy and the growing demand for petroleum products have necessitated further technical developments. Plans have been made for the remodelling of the existing industry and it has been decided to extend until 1976 the concession of the Sociedale Concessionaria da Refinacao de Petroleos em Portugal (SACOR). Technical improvements to be undertaken by the company will necessitate an increase of 50 million escudos in its share capital and the issue of a similar sum in debentures.

Publications & Announcements

NEGRETTI & Zambra have recently published their latest catalogue on hygrometers, containing a comprehensive list of hygrometers of various types—wet and dry bulb, hair, bimetallic, Gregory electrolytic hygrometers, etc.—together with the principles of hygrometry, the mode of action, use, prices and description of each particular type, illustrated with photographs. All types of instrument are covered, and they are all, say the makers, guaranteed for two years. A very comprehensive list.

* * *

ONE of the most important researches now being carried out at the Pest Infestation Laboratory, DSIR, is an investigation of the physical conditions under which pests can survive. The progress of the research is described in 'Pest Infestation Research, 1949' published by HMSO for DSIR. Investigation has also been made of the toxicity of fumigants, the control of blowflies in slaughterhouses and the protection of grain, both before harvesting and during bulk storage.

* * *

THE British Iron and Steel Research Association's annual report for 1950 is now in print, and copies are available on demand from 11 Park Lane, London, W.1. Latest research in the chemistry department at Battersea, Kensington and Glasgow has been on the mechanism of the reduction of iron oxides, the heats of formation of important slag compounds by calorimetric heat of solution. the thermodynamics of phosphorus and chromium in liquid iron, and of sulphur in solid iron, and other subjects. More research has been done on open hearth and other refractories, and the metallurgy division has carried out extensive research on the effects of alloying additions on the properties of pure iron and other properties of various steels. The building of a group of laboratories at Sheffield has been started this year, says the report, and they are expected to be finished in 1951 and 1952. They will greatly enhance the facilities for practical research on steel-making, metal working, metallurgy, corrosion and analytical chemistry.

THE current issue of 'Wiggin Nickel Alloys' (No. 14) includes articles on concentrating sodium sulphide, water treatment, chemical valves and cocks, belt fastenings, pickling plant, enamelling perrits and methods of tipping carbide tools. Instructions on methods of perforating high nickel alloys are given in a well illustrated article showing various items produced in monel and nickel.

Copies of this publication may be obtained on application to: Henry Wiggin & Co., Ltd., Wiggin Street, Birmingham 16.

* * *

E. BOYDELL & CO., LTD., Manchester 16, announce the addition of a quarry type bucket to the range of accessories for their mechanical loader. The bucket, of a reinforced pattern, is equipped with four teeth of cast manganese steel. These teeth enable the loader to penetrate and load stone blasted from the quarry face, up to 15 in. In the medium or small quarry, in addition to excavating, this bucket can be used for loading from stockpiles, and will clean the quarry floor, the versatility of the machine ensuring that the crushing plant is kept at full production. In addition wear and tear on transport vehicles is reduced, as loads can be accurately and smoothly released.

* * *

QUANTITY production is being carried out by E. C. Payter & Company Limited of light-alloy drums to contain certain detergent fluids. The alloy used is 'MG5,' manufactured by James Booth & Co. Ltd., of Birmingham, and it was chosen after exhaustive tests. The liquids in question attacked steel and other conventional materials, but 'MG5' was found to be fully resistant. One of the drums was subjected to a test of handling qualities by being filled with water and dropped repeatedly on to a concrete floor from a height of 4½ ft. Only after the 14th drop did a small leak develop.

It was learnt that the performance of the light alloy drum during the tests was far more satisfactory than had been anticipated, being definitely superior to that of steel drums after the same treatment.

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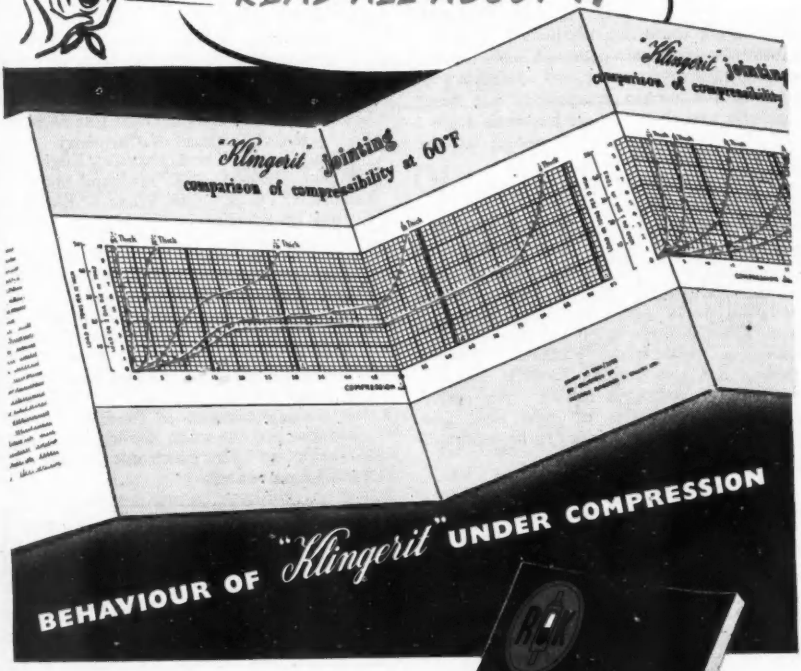

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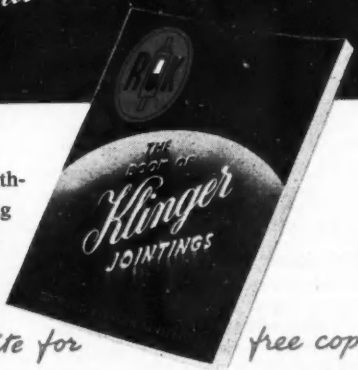

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Market Reports

LONDON.—A steady movement of supplies to the consuming industries and an active inquiry for new business is reported from most sections of the general chemicals market this week. Price changes have been comparatively few but strong price conditions continue in evidence. An exception was the recent reduction of 20s. per cwt. in prices of tartaric acid and cream of tartar resulting from a decrease in the cost of the raw material. A brisk seasonal demand for these two products is reported. Most of the soda products are moving steadily against contracts and available supplies of the potash compounds are being regularly absorbed. There has been a good call for permanganate of potash at the higher quotations now ruling.

MANCHESTER.—The chemical market have little cause for complaint about the rate at which contract deliveries are circulating, especially those for alkalis and other bread-and-butter lines. The textile bleaching, dyeing and finishing trades and other leading industrial users are absorbing substantial quantities and there is no lack of offers of additional home-trade business. Export booking are also coming forward steadily. The market continues strong. An active movement of supplies of most light and heavy tar products continues to be reported.

Next Week's Events

WEDNESDAY 16 MAY

The Chemical Society

Manchester : The University, 6.30 p.m. Professor R. B. Woodward : 'Some Recent Advances in the Chemistry of Natural Products.'

The Chemical Council

London : The Royal Institution, Albemarle Street, W.1, 3 p.m. First in a series of Festival Lectures on 'Chemistry in the Service of Man.' Professor R. P. Linstead : 'Chemistry and the Amenities of Life.'

Oil and Colour Chemists' Association

London: Manson House, Portland Place, W.1, 7 p.m. Paper entitled 'Some Applications of Electronics in the Pigment and Related Industries', given by J. T. Richmond and P. E. Watson.

THURSDAY 17 MAY

The Chemical Society

Liverpool : The University, 4.30 p.m. Professor R. B. Woodward : 'Some Recent Advances in the Chemistry of Natural Products.'

Corrosion Group (SCI)

London : The Royal Institution, Albemarle Street, W.1, 6.30 p.m. Inaugural meeting of the Corrosion Group. Address by Dr. U. R. Evans : 'The Corrosion Situation : Past, Present and Future.'

FRIDAY 18 MAY

Institution of Chemical Engineers

London: May Fair Hotel, Berkeley Street, W.1, 11 a.m. Twenty-ninth annual corporate meeting. Presidential address : 'Some Memorials of Early Chemical Engineers.'

Royal Institute of Chemistry

Birmingham : The University, Edgbaston, 5.30 p.m. Second P. F. Frankland Memorial Lecture by Dr. R. L. M. Synge : 'Biological Aspects of Proteins in the Light of Recent Chemical Studies.'

SATURDAY 19 MAY

Purchasing Officers' Association

Edinburgh : North British Station Hotel. One-day conference. Programme includes papers on 'The Purchase of Castings' by F. J. White, and 'Economic Efficiency' by A. Elliott.

Royal Institute of Chemistry

Swansea : University College, 10 a.m. Discussion on 'The Electronic Structure of Organic Compounds.'

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